The Chemical Age

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Surplus Revenue

IT is highly satisfactory to notice that the Chancellor of the Exchequer has actually realised a surplus of fifty-six and a half millions during the first half of the current financial year. That the Treasury should be so immensely better off than was imagined possible six months ago is a subject for congratulation from one point of view. It is certainly better to have a surplus of fifty-six and a half millions, than a deficit of the same amount. But when he brought in his Budget, Sir Robert Horne anticipated a surplus on the whole year of something under one million pounds; if the first half of the year is anything to go by, Sir Robert is realising surpluses about a hundred and twenty times as large as he anticipated. The discrepancy on the half year is worth more than half of Mr. Gladstone's last Budget, or more than 25 per cent. of our total pre-war expenditure. We shall, no doubt, in due season, be told how wonderful all this is, and business people will crave leave to doubt. Before the war, if a Chancellor of the Exchequer's estimate were falsified by the event, we thought we had got a particularly bad Chancellor of the Exchequer. The old Treasury used to be very proud of its ability to forecast, to a few hundred thousands, the proceeds that would arise from any particular form of taxation. The present state of affairs demonstrates how thoroughly we are at sea, how completely we have lost ourselves, how impossible it is for anybody to know exactly where they are, how chaotic are the conditions all round, and how difficult the task, not only of the Chancellor of the Exchequer, but of every business man. We shall never get back to the old exactitude with the confidence and prosperity which it engendered, until we are able to remove from the purview of the Government and the bureaucracy all those new functions which they assumed during the war, and which they show such a great reluctance to part with. A Budget which is so large as to admit of discrepancies of fifty-six and a half millions sterling in six months is a disturbing influence, large and powerful enough to account, of itself, for a great proportion of the unemployment and depression from which the country is suffering.

The Modern Science of Agriculture

SINCE Liebig in 1840 showed the value of mineral constituents for plant growth, the light thrown by chemical and bacteriological research on agricultural problems has been full of practical usefulness to the scientific farmer. As a result of the work done at the Rothamsted Experimental Station, it is now recognised that there are at least three general principles of crop production. Firstly, the plant must have sufficient supply of all the necessary nutrients—especially nitrogen, potassium and phosphorus, and if these are lacking in any soil they must be supplied, according to the requirements of the particular crop. Secondly, the biochemical decompositions in the soil must proceed smoothly and rapidly. It has long been known that for the satisfactory purification of sewage, regular oxidation of the ammonia present to nitrate must take place; but it was found that this conversion always commenced slowly, though it could be started by the addition of a little soil extract. Thus were discovered the micro-organisms of nitrification, later shown to be of two kinds—one class converting the ammonia into nitrite, and the other continuing the oxidation to nitrate. It was then realised that the soil is not merely a conglomeration of inorganic constituents with some inert organic humus, but a living thing, pulsating with energy. The number of bacteria present in soil is enormous—many millions per ounce; and the nitrifying organisms supply the plant with nitrogen in an assimilable form. Land which has become "sick" contains in many cases too large a population of higher organisms—living amoeboid forms such as protozoa, which feed on the bacteria and reduce their numbers so greatly that these important changes cannot go on at the necessary rate. One cure for such "sick" soils is, therefore, partial sterilisation by steam, or by chemicals, which kills the protozoa without killing all the bacteria. The remaining bacteria multiply very quickly after this treatment, and there is increased nitrate production as a result. It is interesting to note in passing that Virgil's *Georgics* contain an account of a method for

increasing fertility of soils by burning vegetable refuse on the soil-surface before sowing.

The third general principle of crop production is that all the requirements of the plant must be satisfied. Any one of the necessary factors of temperature, moisture, air supply, nitrifying organisms, and mineral constituents of the required kind, including lime, if missing, constitutes a limiting factor preventing the full growth of the plant. Further, the well-known fact that leguminous crops such as peas, beans, and vetches leave the soil in a state of enhanced fertility for following crops of wheat (also referred to in the *Georgics*) is now seen to be due to the ability of such leguminous crops to make use of atmospheric nitrogen, which they do by means of the specific bacteria present in the tubercles or nodules attached to their roots. These organisms draw nitrogen from the air and yield it up to the plant in the form of desirable nitrogenous organic compounds. We are now able to realise the complete food-cycle of nature. The decomposition-bacteria ferment or break down into simpler compounds all petrescible matter from animal substances, and other bacteria nitrify the ammonia so produced with formation of nitrates; while simultaneously other products are obtained, and these all enrich the soil. The plant utilises these simpler compounds as sources of nitrogen, potash, and phosphorus, while by the assimilation of these, with the aid of sunlight and of carbon dioxide and moisture from the air, it builds up the more or less complex organic compounds we know as cellulose or fibrous tissue, sugar, starch, oils and fats, and the proteins, at the same time giving up oxygen gas. The animal uses these complex organic structures for food; and during the process of digestion the nitrogenous bodies, for example, are transformed into the proteins of which animal tissue is built up. The animal rejects certain products (carbon dioxide, urea, etc.) which ultimately return to the air and soil, to be again used as food for plants. In this way partial equilibrium is maintained; but, despite the compensation referred to, there are serious losses of nitrogen to the soil in intensive culture, and considerable losses at all times in the final result. It is necessary, therefore, to counterbalance these losses of nitrogen by artificially manuring the soil after it has been in use for some time. Our natural resources have not been large enough to enable us to carry out in its entirety the programme laid down by Crookes nearly 25 years ago as necessary to preserve the wheat-eating races from starvation—but it is directly due to his stimulus that the nitrogen-fixation industry has been born. The recent meetings of the Chemistry Section of the British Association had before them in a series of papers the latest developments of this new industry, with its offshoots the hydrogen and nitrogen industries. We have already given in our columns abstracts of the papers dealing with these subjects, and it only remains to say that Germany is to-day capable of supplying herself with all the nitrogenous fertilisers she needs, without importation of nitrates or similar compounds. It cannot be too strongly impressed upon the Government and the undertakings concerned in these industries that our supreme duty at the present time is to ensure that our own capacity in this connection should be in no way inferior to that of all possible rivals.

French Dyestuffs Production

Some enlightening facts concerning the French dye industry are given by M. Charles Normand in his Paris Letter to the *Journal of Industrial and Engineering Chemistry*. Commenting on the fact that the syndicate of dyestuffs consumers has taken the initiative in asking for Customs regulations to protect the industry, but limiting this protection to dyes made in France, he expresses the opinion that the measure seems to be rather tardy in view of the daily increasing production of French dyes. The French importation of dyes before the war reached 95 per cent. of the national consumption. In 1920 the amount of imports was not more than 60 per cent.; in 1921 and at the beginning of 1922 it decreased to 20 per cent. In 1920, 50 per cent. of the amount imported came from Germany (3,000 out of 6,000 tons); in 1921 the importation was only 400 tons, coming from Germany.

This decrease of importation is due largely to the efforts of the National Company of Dyestuffs and Chemical Products. The rumour concerning the union of this company with the German companies has been, and is still contradicted. Nevertheless, the dye company has bought a number of patents from the foreigners. It obviously does not wish to lose time in perfecting the manufacture of intermediate products; with this end in view it has resolutely acquired all the manufacturing processes that it has been able to find concerning these products. The procedure of selling dyestuffs by chemical engineers specialising in dyestuffs is being developed in France. This method of selling the manufactured products, which, by the way, was recommended by a contributor to The Chemical Age several months ago, has been very successful. According to M. Normand, it gives satisfaction to weavers and dyers by permitting collaboration with technical colour chemists who have an intimate knowledge of the products which they are handling.

"Dr. Lagueur" Unmasked

We have some recollection of a would-be humorist endeavouring to distinguish between pure and applied chemists on the basis that a pure chemist desired a little money so that he might make a great increase in knowledge, and an applied chemist desired a little knowledge in order that he might make a great deal of money. Our function, in the main, is to assist the applied chemist; but now and then we endeavour to remember the needs of the pure chemist, and our columns are always at the service of those who wish to discuss the problems of this science. We feel that we need make no apology to our "applied" readers for such excursions. If we publish articles such as that by "Dr. B. Lagueur" on the Problem of Solution, and if these attract attention, then we consider our selection to have been justified; and in this particular case the unconventional style of the article did not deter our readers from perusing it and writing to us on the subject. The author of this article—so he informed us—thought he had concealed his identity by imitating the style of Izaak Walton. Both he and we now know better, and we are probably disclosing no secret in stating that "Dr. B. Lagueur" is merely a pen-name adopted by Dr. Stephen Miall, who seems

anxious to become a sort of unlicensed jester among chemical writers. An editor has to consider first and foremost the basic fact that articles are intended to be read. If an article is readable that is of much greater importance than a guarantee that it has been written by someone with a profound knowledge of the subject. We do not suppose that Dr. Miall claims to be an expert on the theory of solution. Had he been such he would probably have set his name to the article in the first place. It is, however, a source of considerable satisfaction to us to know that this particular article was very widely read, and that its unconventional manner of reasoning prompted many of those with high-placed names in chemical science to join in the chorus of approval. For this reason we propose to publish the article and the whole of the correspondence relating to it in the form of a pamphlet, which, we hope, will be available within the next few days.

We take a certain amount of pride in the fact that the success of THE CHEMICAL AGE has been largely due to our not being hampered by long traditions which seem to demand that every trace of humour and human nature should be rigidly excluded from anything technical. Our own readers as well as the readers of other chemical journals are not in reality so solemn as is some of the material which is nowadays provided for them. In other words, we have yet to learn to appreciate the superiority of literature which one consults as a more or less irksome duty as opposed to that which one can turn to as a part of one's recreation.

Increasing Chemical Exports

A RATHER marked decrease in imports and a continued, though not very heavy, rise in exports are disclosed by the declared values in the Board of Trade Returns for September. Foreign trade generally seems to be improving, albeit rather slowly, and the trade balance apparently continues to move in our favour. Taking the probable figures of "invisible exports" for the period from June to September, the average of profit on foreign trade has fallen to less than one-half in the period mentioned. Although such a short period is frequently unreliable in computations of this nature, it seems more than probable that the lower average of profits has been due to price movements and to a very laudable desire to retain markets. The figures of values for most commodities bear this out; on the other hand it is interesting to note that practically all the quantities indicate a revival of trade in point of volume.

Although there were several large increases in the quantities of certain chemicals imported during the month, the value of imports, at £1,032,511 was £92,510 less than the August total. This decrease was mainly attributable to smaller imports of borax, sodium compounds, extracts for dyeing, and ground barytes. Among the items against which the more important increases are recorded are calcium carbide, glycerin, potassium compounds and dyestuffs generally.

While the export side at £1,733,883, does not show nearly such a big increase as it did in August, it is making steady progress with a further increase of £71,274. Compared with the previous month's recovery, this figure appears to be small, but it must be remembered that the August improvement followed one of the worst months of the year. The most notable export increases are recorded against tar oil and creosote, bleaching powder, sodium sulphate, dyestuffs, and painters' colours and materials. Sulphate of ammonia shipments were only slightly higher, while exports of sulphuric acid, copper sulphate, potassium compounds, glycerin, and zinc oxide were smaller.

Points from Our News Pages

Investigations into the properties and composition of "Dekalin" are described by J. B. Coleman, F.I.C., and P. Bilham, B.Sc. (p. 554).

More thorough co-operation between chemists in the interests of the profession was urged by Dr. E. F. Armstrong, at the annual London dinner of the Society of Chemical Industry (p. 561).

Experiments regarding the preservation of iron and steel from corrosion and rust were described by Dr. J. Newton Friend, in his presidential address to the Oil and Colour Chemists' Association (p. 563).

The dyeing and finishing of ramie was dealt with by Mr. W. Marshall, at the opening meeting of the Manchester Section of the Society of Dyers and Colourists (p. 564).

Our London Market Report states that the activity reported last week has been maintained and that the tone is very firm, with further advances in some products (p. 571).

According to our Scottish Market Report, a slight improvement, with fairly numerous inquiries, has characterised the business of the week (p. 573).

Books Received

INORGANIC CHEMISTRY. By E. J. Holmyard. London: Edward Arnold and Co. Pp. 558. 6s. 6d.

THEORIES OF ORGANIC CHEMISTRY. By D. Ferdinand Henrich. London: Chapman and Hall, Ltd. Pp. 603. 30s.

RESEARCHES ON CELLULOSE. By Charles F. Cross and Charles Dorée. London: Longmans, Green and Co. Pp. 253. 15s.

The Calendar

Oct. 23	Institute of Chemistry (Huddersfield Section): "The Present Position and Future Prospects of the Institute and the Profession." The Registrar of the Institute.	Huddersfield.
24	Northern Polytechnic Institute Chemical Association. First Annual General Meeting. "The Effect of Legislation on Chemical Industry." Mr. W. J. U. Woolcock. 8 p.m.	Holloway, London, N.7.
26	The Chemical Society. Lecture by Sir W. H. Bragg and Professor W. L. Bragg. 8 p.m.	Meeting Hall of the Institution of Mechanical Engineers, Storey'sGate,S.W.1
27	The West Cumberland Association of Chemists, Chemical and Metallurgical Engineers. "Coal Washing." J. E. Christopher.	Technical College, Workington.
27	The Institute of Metals (North-East Coast Section): "The Production of Large Metallic Crystals and Some of their Properties." H. C. H. Carpenter, F.R.S. 7.30 p.m.	Armstrong College, Newcastle-on-Tyne.
27	The Society of Dyers and Colourists. (Manchester Section.) Papers by Prof. F. L. Pyman, L. B. Timmis, L. G. Radcliff and W. Gibson.	College of Technology, Manchester.

The Properties and Composition of Dekalin

By J. B. Coleman, A.R.C.S., F.I.C., and P. Bilham, B.Sc.

The following article deals with an investigation which was undertaken on the suggestion of the Building Research Board of the Department of Scientific and Industrial Research, who defrayed the costs of the work. During the war "Dekalin" and "Tetralin" (hydrides of naphthalene) were of great importance in Germany owing to the scarcity of natural resins and drying oils. The Germans were restricted almost exclusively to the use of artificial resins produced from phenol-formalin compounds, and the above-named turpentine substitutes were largely used as solvents for these resins.

PATENTS under which the hydrides of naphthalene are manufactured were taken out as early as 1915, but they were not published until 1918, and some having the letter "K" after their number have not yet been made public. All these patents dealing with the purification of naphthalene and its subsequent hydrogenation have been transferred to the company trading under the name of Tetralin G.m.b.H. This company is installed at Rodleben, near Rosslan, and produces about 100 tons of hydrides of naphthalene a day. The main products are Dekalin, Tetralin Extra, a mixture of Dekalin and Tetralin, Tetralin, and Essence of Tetralin, a mixture of Tetralin and cyclohexanol. These substances, from all reports, are excellent solvents for use in the lacquer and varnish industries, and they also form by far the best substitutes for turpentine. They have excellent solvent powers on the usual resins and driers and are miscible in all proportions with all the usual solvents except alcohol below 95 per cent. and ordinary wood-spirit. The resins used in the manufacture of alcoholic varnishes are not noticeably altered or dissolved by the Dekalin solvents.

The high boiling point and flash-point of Dekalin and Tetralin are advantages when using them in varnish kettles, much higher temperatures being possible with reduced fire risk and loss by evaporation. As a substitute for turpentine Tetralin is unique, as it possesses the property of autoxidation, and, therefore, acts like turpentine as an oxygen carrier to the drying base.

The investigations on the physical and chemical properties of a specimen of Dekalin obtained from an English firm of wholesale chemists by the Building Research Board of the Department of Scientific and Industrial Research were carried out in order to show its suitability or otherwise as a substitute for turpentine. The work comprised the determination of the physical properties of Dekalin for comparison with those of turpentine, the determination of its composition and the verifying of the constituents and the devising of a method of analysis. The comparison of the residue on evaporation and the rate of evaporation of Dekalin and American turpentine were also undertaken.

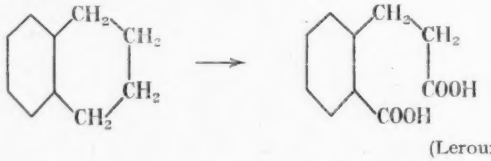
The physical properties of Dekalin that were determined were as follows. The density at 20° C. was found to be 0·8947. The refractive index at 20° C. for the sodium line was determined and the values (μ) $D20° = 1·4815$. The flash-point in Abel's standard apparatus was 51·6° C. The viscosity which offers some criterion of the thinning power was determined at 40° C. in Redwood's apparatus. The absolute value of the viscosity is 100 $\eta = 0·675$. The repeated fractionation of a considerable quantity of Dekalin was undertaken. This showed that there were two main constituents present. One which comprised about 80 per cent. of the oil and boiled at 180° C, the other having a much higher boiling point. The separation of the two constituents was not very complete. The graph given on page 555 is of the third stage in the fractionation. The first one or two per cent. was mainly water, the main fraction still contained some of the higher boiling point constituent and the last fraction, besides containing some of the low boiling point constituent, suffered autoxidation.

The chemical examination of the sample of Dekalin was next undertaken. The usual tests for the elements were carried out. Carbon and hydrogen alone were found to be present. Oxygen was found to be absent by the "combustions" below.

Decahydronaphthalene $C_{10}H_{18}$ is saturated but the tetrahydro-compound $C_{10}H_{12}$ still contains three double bonds. Tests for unsaturation were carried out. The addition of the oil to bromine in carbon tetrachloride causes decolorisation. On adding the oil to strong sulphuric acid part of it was absorbed and the sulphuric acid was coloured brown. These tests show the presence of an unsaturated body. Fuming nitric and trong nitric acids had but a slight effect. A small quantity of a yellow nitro-compound was deposited. The absorption with strong sulphuric acid was then carried out on a large quantity of the oil. The residual oil was washed with alkali and steam-distilled. It was separated, dried, and again distilled. This boiled at 188·5° C. and proved to be identical with the main constituent obtained by fractionation. The main constituent as obtained above was then shaken many times with successive quantities of sulphuric acid, composed of 50 per cent. fuming sulphuric and 50 per cent. concentrated sulphuric acid. The product was then washed with alkali, steam-distilled, and dried over calcium chloride. It was then fractionally distilled and dried over metallic sodium.

Combustions on this purified compound gave the following results:—Hydrogen, 12·94 per cent.; carbon, 87·05 per cent. The theory for decahydronaphthalene is:—Hydrogen, 13·04 per cent.; carbon, 86·96 per cent. This result, together with the comparison of the boiling-point, density, and refractive index of the purified compound, with those assigned to decahydronaphthalene by Leroux (Comptes Rendus 1904, 139, 672), give conclusive proof that the main constituent of Dekalin is the saturated hydrocarbon $C_{10}H_{18}$.

The unsaturated portion was almost impossible to isolate but the following tests gave proof that it was tetrahydronaphthalene. A portion of the original Dekalin was oxidised with acid and alkaline permanganate respectively. In each case a large proportion of the oil remained unchanged and was steam-distilled off (making the solution alkaline if necessary). The oil so obtained was mainly the decahydride. In the residual liquid or acidifying orthocarboxyhydrocinnamic acid was found. This is produced by the oxidation of the tetrahydronaphthalene.



(Leroux.)

The action of the absorption by sulphuric acid is explained by the formation of a sulphonic acid of the residual benzene nucleus. Similarly, the action of nitric acid gives a nitro-compound.

The presence of the tetrahydride and also its oxygen-carrying properties were shown by the following tests. A Dekalin-water emulsion was treated with a solution of potassium iodide that had been acidified with dilute sulphuric acid. An immediate liberation of iodine occurred and this dissolved in the oil with a violet colour. The tetrahydride absorbing oxygen from the air gives a peroxide, which is decomposed by the water to give hydrogen peroxide. When freshly distilled and free from this peroxide Dekalin will not answer this test. Also the purified compound will not give this result. Again, on adding a drop of Dekalin to an alkaline solution of $KMnO_4$ the pink colour is immediately changed to green, showing a rapid absorption of oxygen.

The oil was then submitted to catalytic dehydrogenation. The usual catalysts were tried without success, but a catalyst recommended by Leroux in his paper was tried with good results. This was lime, and at red heat the vapour of Dekalin when passed over a layer of this catalyst, gives naphthalene and hydrogen. This gives conclusive proof of the nature of the oil.

The percentage of the decahydronaphthalene present was arrived at by four methods. These depend on (*a*) the value of the density, (*b*) the refractive index, (*c*) the fractionation results, and (*d*) the absorption by sulphuric acid.

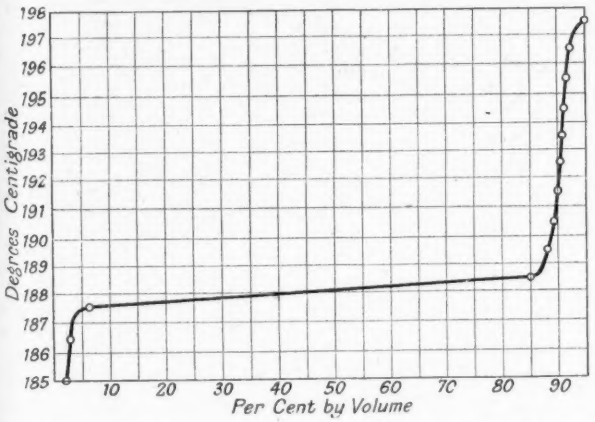
(*a*) The value of the density of the sample of Dekalin was found to be ·8947 at 20° C. The value for pure decahydro-

naphthalene is ·877 at this temperature and for tetrahydronaphthalene ·966. From these figures, assuming there is no contraction on mixing the percentage by volume of the decahydride present is 80·14 per cent.

(*b*) In the same way from the value of the refractive index and the values for the pure compounds the percentage of the decahydride is 80·74 per cent.

(*c*) From the fractionation curve a rough estimate of the percentage by volume of the decahydride present may be obtained as both fractions contain a little of the other constituent the value may be judged at 80 per cent.

(*d*) The original Dekalin was submitted quantitatively to the treatment with sulphuric acid previously described for the



purification of the main constituent for combustion. The residual oil was taken to be the decahydride. The percentage by volume by this method is 78 per cent.

From the above results it will be seen that Dekalin consists of 80 volumes of Decahydronaphthalene $C_{10}H_{18}$ mixed with 20 volumes of tetrahydronaphthalene $C_{10}H_{12}$.

The residue on evaporation was compared with the residue on evaporation of turpentine by evaporating equal quantities (about 15 grammes) side by side on the water bath, and then putting both vessels into a steam oven at 100° C. for half an hour. Dekalin left a residue of ·001935 per cent., turpentine left a residue of ·01516 per cent.

The relative rates of evaporation of Dekalin and American turpentine were compared by using two similar dishes, each containing a filter paper. On the filter papers were dropped a little Dekalin and turpentine respectively. The dishes were repeatedly weighed until no further loss was observed, showing that evaporation had ceased. As the dishes stood side by side the conditions of experiment were the same for both. The time required for evaporation was noted in each case. The ratio of the weight of turpentine to the weight of Dekalin evaporated in equal intervals of time was found to be 2·89.

Below is given a table in which the characters of Dekalin and turpentine are compared.

Property.	Dekalin.	American turpentine.
Refractive index	1·4815	1·4667 to 1·470
Optical activity	None	Active
Specific gravity	·8947	·862 to ·875
Range of temperature of distillation	180°–197° C.	156°C.–180° C.
Flash-point	51·6° C.	32° C.
Viscosity (100°)	·675	1·07
Behaviour with concentrated Sulphuric Acid	Tetrahydride absorbed. Decahydride left	Polymerised to resins and completely absorbed
Relative rate of evaporation	1	2·89
Percentage residue of evaporation	·001935	·01516

From the condensed table of the properties given above it will be seen that the high flash point of Dekalin as compared with turpentine enables higher temperatures to be used in varnish-making, with the consequent better mixing of the ingredients. Again, the high boiling point reduces the loss by evaporation. The viscosity again indicates a superior thinning power. The slow rate of evaporation of Dekalin as compared with that of turpentine at first appears a disadvantage, and it prohibits the use of Dekalin in quick drying varnishes. However, as a substitute for turpentine it is no real disadvantage, as the drying action of paints commences when the turpentine has evaporated off, whereas the drying action with Dekalin continues all the time it is evaporating owing to its excellent oxygen-carrying properties. In addition, the Dekalin compounds leave practically no residue on evaporation, which is an advantage, since other turpentine substitutes, such as "white spirit," leave a perceptible residue. On the whole, Dekalin seems an excellent substitute for turpentine, more especially for paints, and an excellent solvent for slow-drying varnishes. It is also non-poisonous.

The Nature of Acids

To the Editor of THE CHEMICAL AGE.

SIR,—Having read "Student's" letter in your issue of October 7, I think there is a further point which perhaps I ought to have explained.

The characteristic properties and reactions of all acids are due entirely to the presence of the H-ion. Consequently, when in "one body," or, in scientific language, when unionised —*i.e.*, not split up into the two ions, and therefore there being no H-ion, the compound cannot possess acid properties. The influence of the=CO group comes into play *only* when ionisation can take place, causing the acid to break up in such a way as to give a H-ion instead of some other ion, say, OH.

Ionisation—*i.e.*, splitting up into two parts—only occurs when the substance is dissolved in ionising solvents, such as water, so that in the anhydrous (dry) state one would expect that acids would not exhibit acid properties, and such is the case—*e.g.*, dry hydrochloric acid does not redden litmus.

"Student" has apparently misunderstood my interpretation of Moureu's words. Moureu has no intention of giving an explanation of the cause of acidity of an organic acid, but his statement is equivalent to saying that all organic acids proper contain the carboxyl (COOH) group.—Yours, etc.,

"QUALIFIED CHEMIST."

Non-Ferrous Metals Research

A MOST interesting pamphlet, "Research Work in Progress," has been issued by the British Non-Ferrous Metals Research Association, of 71, Temple Row, Birmingham. The investigations in hand cover many important problems of the copper, brass, aluminium, nickel and lead industries as well as subjects of importance to all users of such metals. The support given to this Association by the leading firms seems to be most encouraging, but the field covered is very wide and many of these researches, such as those on the improvement of brass, on metal-polishing, and on soldering, should attract the attention and support of many other sections of industry

The user is apt at first sight to overlook the fact that he is even more interested in the improvement of quality of his raw material than the manufacturer of the metal. In the case of failure, however, it is the user who always bears the greater loss, since he sacrifices all the time and workmanship which has been expended on the article being manufactured. The Bureau of Information of the Association also seems to be doing excellent service in distributing to members reports of the results of the experimental researches, and acting as a live intelligence service, collecting and distributing information likely to be of service to the industry from the far corners of the world. Some indication is given of the further work which the Council hope to take up when additional financial support is forthcoming.

Carbonised Lignite Fuel

IN the course of the lignite investigations being conducted by Mr. W. W. Odell, fuel engineer of the U.S.A. Bureau of Mines, in co-operation with the University of North Dakota, two carloads of lignite were recently carbonised at the rate of 10 tons per day. A satisfactory residue was obtained at an approximate cost of $5·50 per ton, as against a cost of approximately $6·25 a ton for the residue produced in the oven used during the experiments conducted during the summer of 192 .

"Chemical Age" Letters from America

Some First Impressions—The Chemists' Club—British Firms on Tour—A Note on the Metallurgical Chemist

We publish below the first of a series of letters from the United States from Mr. F. E. Hamer, Editor of "The Chemical Age," who arrived in New York on Tuesday, October 3, and will, during a stay of some weeks, describe his impressions gained in visits to numerous chemical and allied works.

THE CHEMISTS' CLUB, NEW YORK,
October 5, 1922.

BEFORE coming here one had heard much—and all of it favourable—of the Chemists' Club of New York, and the first of these letters home is being written under its hospitable roof. In view of possible developments in connection with the Chemical Industry Club, London, it may be useful to give later some more detailed account of this admirable institution and of the plans now under consideration for further extending its influence and membership. It is enough for the moment to record one's sense of the quiet comfort and dignity which seem to me to be its characteristic features, of its friendly and hospitable atmosphere, and of the kindnesses which all its officials seem anxious to shower upon one.

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It says something for the international relations already existing between the two countries that within a few minutes of arrival one found oneself in a sort of family party. There was H. C Parmelee, the Editor of *Chemical and Metallurgical Engineering*, whom I first met at a Savoy dinner to American journalists, presided over by Lord Burnham, and addressed by Mr. Balfour, as he then was, and who had remained through a sweltering afternoon at the docks to welcome me off the boat. There was our benign and spacious friend, Dr. Ellwood Hendrick, very happy in his memories of England, and eager in his inquiries about those he met there. There was Mr. Duggan, a former chairman of the Club, incorruptibly English still, in spite of his twelve years' stay in the States, and looking forward to a visit to the old land a little later in the year. From some mysterious source was produced a mature liquor which served as a wonderfully good substitute for the real thing, and helped one to understand the philosophic spirit in which an American may still regard prohibition. And later, round a small table, to a very select few, Hendrick read extracts from one of the choicest letters which that accomplished writer, Professor H. E. Armstrong, ever addressed to an intimate. Alas! that the nicest things one thinks and says must too often never see the light.

To-morrow evening, October 6, the New York Section of the American Chemical Society meets in Rumford Hall, which is part of the Club premises, to hear some "observations and impressions of Foreign Chemical Work," by Dr. Charles Parsons, the secretary of the American Chemical Society, Dr. Hendrick, and Mr. J. V. N. Dorr, consulting chemist and engineer of New York, whom I met during the Glasgow meetings of the Society of Chemical Industry. I have been asked to add a few words myself about British chemical industry from another angle. Altogether the members seem to constitute a very happy and harmonious family.

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These matters, however, must wait for the present, in order to allow a few words to be said of the voyage. With the exception of a moderately playful gale in mid-ocean the passage was an extremely pleasant one. The *Majestic* is simply a huge palace, and in the dining-saloon or the ball-room in the evening it was difficult to realise one was in Mid-Atlantic. There were many interesting people on board, apart from passengers like Lord and Lady Louis Mountbatten. A prominent figure was Sir Harry McGowan, chairman of Nobel Industries, Ltd., who with three co-directors—Mr. H. Donald Hope, Dr. Elliot, and Mr. Metcalf—is paying a business visit to the States, and afterwards proceeding to Canada, where the company have considerable interests Sir Harry seems well satisfied with the position of affairs, and thinks that England has every reason to be proud of the way in which she is carrying her burdens. The worst, he confidently believes, is over, and if only the commercial men of all countries were allowed to get on with their business he is confident that trade would soon begin to move. Another passenger, whose company helped to relieve what little monotony was experienced during the six days the voyage occupied, was Mr. Jasper E. Crane, European manager of E. I. du Pont de Nemours and Co., who is paying a visit for a few weeks to the head office at Wilmington, and to several of the company's manufacturing plants.

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Incidentally I came across an interesting testimony to the practical value of the metallurgical chemist in industry. My particular colleague during the voyage was Mr. Harold M. Duncan, managing director of the Lanston Monotype Corporation, Ltd., who was paying one of his periodical visits to the works of the American Company.

"We have," he said, "long recognised the value of research into the qualities and characteristics of the various metals used in our machine, and there can be no doubt at all that it is productive expenditure that has justified itself at every point. As the result of research in our own laboratory we have substituted a scientifically exact and uniform procedure for what was largely an empirical one, and are now enabled to standardise our materials after having determined by experiment the best material for a given function of our machine. This has enormously reduced wastage, and it ensures to us that every vital part shall be uniformly equal to the work given it to do. Where there is mass production of machinery, especially where high precision is needed, the metallurgical chemist more than justifies his employment. The time is approaching when a laboratory suitably equipped for research work as well as for testing metals will be an integral part of every engineering works. In a number of concerns a chemist is regularly employed, but up to the present it is, I believe, the exception both in Great Britain and the States to regard it as an established feature of sound engineering practice. It is becoming imperative to compensate for the high cost of manufacturing by the elimination of waste. This the chemist can assist to a marked extent by working in co-operation with the mechanical departments. The problem is largely one (given a properly designed machine) of suitability of material and methods for converting it. The chemist determines the former and not an insignificant part of the latter. Every engineer will readily admit that the chemist is destined to play a very important part in the industry of the future."

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I understand that representatives of Brunner, Mond and Co. are over here on a business visit, and the arrival of Sir William Alexander, now so well known in connection with the dyestuffs industry, is awaited with interest.

Here these odds and ends, constituting my first letter, must come to an end in order to catch the mail.

F. E. HAMER.

The Generation and Utilisation of Cold

Joint Meeting of the Faraday Society and British Cold Storage Association

THE Faraday Society and the British Cold Storage and Ice Association held a joint meeting on Monday at the Institution of Electrical Engineers, London, to discuss the present position of the above subject. The meeting was divided into three sessions, commencing at 2.30 p.m., and a long series of papers was read and discussed. Professor A. W. Porter, F.R.S., President of the Faraday Society, presided at the first session, Mr. George Goodsir, President of the British Cold Storage and Ice Association, was in the chair during the second session, and Mr. James Swinburne, F.R.S., took charge of the meeting at the final session.

Death of Professor Kuenen

Professor A. W. PORTER, in opening the proceedings, said this was the thirtieth general discussion that had been arranged by the Faraday Society, most of them being in conjunction with other societies. On the present occasion the Faraday Society was acting in conjunction with the British Cold Storage and Ice Association, and he had great pleasure in welcoming the members of that Association. They had all looked forward to seeing Professor Kamerlingh Onnes and Professor J. P. Kuenen, both of the Leiden Laboratory, but on the very eve of the completion of the arrangements for this meeting they heard of the sudden and unexpected death of Professor Kuenen. Professor Kuenen was well known to many in England. He himself remembered him when he worked with Sir William Ramsay at University College. After that Professor Kuenen was appointed Professor of Physics at Dundee. He was best known scientifically for his work on binary mixtures of vapours and liquids, and he was taking an active interest in the preparations for this meeting when his untimely death occurred. Professor Onnes, owing to his delicate health, was also prevented from coming. The duty of representing the Leiden Laboratory, therefore, fell upon Professor C. A. Crommelin, whom they were delighted to honour and welcome to the meeting. They had still other disappointments than those he had mentioned. They had also expected M. Georges Claude, of Paris, representing Messrs. Claude and Co., but he also was unable to be present, but he had sent in a paper of which an account would be given to the meeting.

Continuing, Professor Porter said he had been asked to make a few general remarks about the subject of refrigeration. This was not the place to go into great detail concerning the principles of mechanical refrigeration. They were all based upon the fundamental fact that heat will not flow spontaneously from a cold to a hot body. The transference could be effected only by the performance of mechanical work. The most theoretically perfect way of doing this was by a contrivance which passed the substance through a reverse Carnot cycle. In such a cycle the heat could be removed from a refrigerated material at a low temperature, T_2, and the amount passed out of the system into a condenser at a higher temperature, T_1, by the aid of the performance of work. The object in any such device was to get as much heat transferred as possible for a given performance of work, and what would be referred to during the proceedings as the coefficient of performance, was the ratio of the heat transferred to the work necessary to effect the transference. This value of the coefficient of performance represented the unattainable limit. In practice, even if the Carnot cycle be arrived at, additional work had to be done owing to the frictional and other losses, and the coefficient of performance was correspondingly less. The Carnot cycle required that the operation of expansion should take place in a cylinder in much the same way as in a steam engine, but in the reverse sense.

The Lowest Temperature

Professor Crommelin then read a paper by Professor Kammerlingh Onnes "On the Lowest Temperature yet Obtained," in which were set out at considerable length the experiments and methods used in approaching to within less than one degree of the absolute zero. The author pointed out that one problem that naturally came to the front in that discussion was the extension to lower temperature of the domain in which researches can be carried out. As soon as efforts undertaken in the Leiden Laboratory to liquefy helium had succeeded, an attempt was made to solidify it by evaporation under reduced pressure.

In the early experiments, with regard to the obtaining of solid helium, the result was disappointing. It appeared that the region of temperatures, in which the properties of substances could be investigated by means of baths of liquid helium, extended farther than might have been hoped for in analogy with the other gases of low critical temperature, and so far the result was gratifying. For it was very difficult to obtain, by means of some definite substance, constant and homogeneous temperatures below the melting point of that substance. With helium the difficulties would be so great that the temperature of solidification might be considered a limit below which it could not usefully be employed. Therefore in the absence of a more volatile substance a limit would here have been put to science.

The author then dealt very fully with improvements which had been made in the apparatus, and described the measures which had been taken for the removal of the helium from the evaporation, minimising the heat conveyed to the evaporating helium, minimising the frictional resistance on the way from evaporating helium to pumps, determinations of pressure and temperature, etc. Dealing with the lowest limit of evaporation pressure, the author suggested that as there was previously no doubt that helium had a maximum of density, and as it was not solidified at a temperature much below that of the maximum of density it might be possible that helium would remain liquid even if it was cooled to the absolute zero.

In conclusion, it was stated that the lowest temperature yet attained was some hundredths of a degree below 0·90 K. As a result of the work which had been described they had progressed, in round numbers, ⅓rd of a degree, and the author was of the opinion that if they could have gone another ¼th of a degree further they would have arrived at the limit obtainable in the ordinary way of helium. If it was considered that our knowledge of atomic structure rendered it improbable that another substance could be discovered, or obtained in another way, more volatile than helium, then the limit indicated, from which we were separated by only such a small amount, would seem an absolute one.

Ethyl Chloride

In his paper on the above subject, Professor C. F. JENKIN said that ethyl chloride was a very convenient material for refrigeration. It did not attack metals, but it did contaminate mercury, so that mercury manometers could only be used for pressures less than the vapour pressure corresponding to the room temperature. It attacked india-rubber, but vulcanised rubber tubing and corks could be used, though they leaked a little. They swelled considerably, but returned to their original size when the ethyl chloride dried off. Pure rubber tape was softened almost to solution. Vulcanite swelled moderately. It caused most woods to swell, but lignum vitæ could be used for valves, etc., when a non-conductor of heat was required. Bakelite was also useful as a non-conductor; it only swelled very slightly.

Liquid ethyl chloride dissolved a small quantity of water, but could be dried by passing it through calcium chloride drying tubes. With water it formed very remarkable ice crystals. Similar crystals formed at the throttle valve in a refrigerating machine if there was any water dissolved in the ethyl chloride, and quickly choked the valve. Ethyl chloride was also a convenient cooling material for use in laboratories; when sprayed on to any object the temperature is quickly reduced to −20° C. or lower.

For mechanical refrigeration ethyl chloride was very suitable. The vapour compression cycle was the one used. The pressures corresponding to the ranges of temperature commonly required were very low, for example for a range of ±20° C., the pressures were 19·4 and 3·5 lb. per sq. in. absolute. The type of compressor generally used was a rotary pump (of the Roots Blower type). Oil being soluble in ethyl chloride could not be used for lubrication, so pure glycerin was employed.

To avoid air leaks all valve spindles, compressor shafts, etc., had to be sealed with glycerin, so that any leakage was of glycerin.

The inflammability of ethyl chloride was its most serious drawback. To get over this various "non-flam ethyl chlorides" had been put on the market. These were mixtures of ethyl chloride with large proportions of ethyl bromide. The mixture was not only non-inflammable but could be used as a fire extinguisher. Its properties as a refrigerator were not very different from those of ethyl chloride, but as it was heavier than glycerin, special separators were necessary.

In conclusion, the author stated that he was carrying out an investigation of the thermal properties of ethyl chloride for the Food Investigation Board, and that complete θ-φ and I-φ charts would shortly be published.

Low Thermal Conductivity

Dealing with "Some Materials of Low Thermal Conductivity," Dr. EZER GRIFFITHS said that from the point of view of the refrigerating engineer, the ideal material for cold storage insulation would be an assemblage of minute gas cells totally enclosed in a light framework impervious to moisture. Hermetical sealing of the cells was essential, for a water-logged material was useless for insulation purposes. Besides the fact that the value of the thermal conductivity of water was about ten times that of the conductivity of the materials usually employed for insulating purposes, the presence of moisture was liable to set up decomposition in substances of organic origin. Consequently many excellent thermal insulators, such as cotton waste and wood sawdust, were ruled out on account of their rapid deterioration in the presence of water.

Dr. Griffiths, in referring to some materials which might be worthy of study, said that methods had been devised for the conversion of rubber into a highly cellular form, the resulting products having an exceedingly low density. The cellular structure of the material immediately suggested the possibility of its use as a heat insulator. Balsa, the wood of a tree growing in Ecuador, had the advantage over such materials as cork in that it could be worked with ordinary wood-working tools. The wood was subject to decay, but it was claimed that with preservatives it was possible to make it sufficiently waterproof for cold storage insulation. Other materials dealt with by the lecturer were the fibres of the tree, "Kingia Australis," eel grass mats, compressed peat, and peat treated with bituminous material.

In conclusion, Dr. Griffiths pointed out that the thermal conductivity of insulating materials in general was not an invariable physical constant. It followed that it was advisable to test samples of various consignments just as it was desirable to determine the calorific value of a fuel.

Thermometric Lag

A paper on "Thermometric Lag, with especial reference to Cold Storage Practice," by Dr. E. GRIFFITHS and Mr. J. H. AWBERY, was then read. The authors pointed out that temperature control was a factor of such vital importance to the successful operation of a cold store that the instruments employed should receive the most thorough study. Mercury in glass or spirit thermometers were almost universally used for such measurements and had the merit of extreme simplicity. For distant reading work the resistance and the mercury in steel thermometers had obvious advantages and were now finding applications.

The object of the experiments described at some length in the paper was to obtain numerical data as to the magnitude of some of the possible sources of error in the measurements when mercury or spirit thermometers were employed for taking the temperature of the atmosphere of a ship's hold by withdrawal of the thermometer to the deck for reading. They also gave information as to the error introduced by the "time lag" of the thermometer if the temperature of the store happened to be changing rapidly. Besides the spirit and mercury thermometers generally employed in such measurements, tests were made on a resistance thermometer and a distant reading mercury thermometer.

Measurement of Low Temperatures

In a note by C. R. DARLING it was stated that amongst practical devices for the measurement of low temperatures, the convenience of a thermal junction, coupled to a suitable indicator, was apt to be overlooked. Some years ago, when engaged upon the determination of the congealing points of certain oils and other liquids, the author had constructed an instrument (shown) which consisted of a flexible couple of Hoskins' alloys, and a portable indicator of the pivoted, moving-coil type. Correction for changes in the temperature of the atmospheric junction could be made by adjusting the pointer so that its position on the scale coincided with the reading of a mercury thermometer inserted in the lid of the indicator. The scale was calibrated at the National Physical Laboratory, the lowest reading being $-200°$ C., and the apparatus proved quite satisfactory in use. Its advantages over a pentane thermometer were that it responded more quickly to changes in temperature, and could be used in metal vessels and enclosures under conditions in which the readings of a pentane thermometer would not have been visible. A recent check of the calibration at the temperature of solid carbon dioxide showed that the instrument had maintained its accuracy. From this experience, the author suggested that the thermo-electric method of measuring low temperatures might with advantage be applied in many cases where other methods were now in use.

Second Session

Mr. GEORGE GOODSIR (President of the British Cold Storage and Ice Association), in opening the second session, said he was afraid that when the discussion came to deal with liquid air and such matters, the members of his association might find themselves a little out of their depth. The temperatures which the members of the Faraday Society handled quite unconcernedly were far beyond the wildest imaginations of his members in the way of cold, and their lowest temperatures were mere summer coolness beside what others were accustomed to speak about. Some day, perhaps, liquid air and other recent products of science might be made available for the ordinary work of preservation of perishable food, but he did not think that was just yet. Meantime, the discussion might open their eyes to possibilities in that direction.

Industrial Methods of Liquefaction

Mr. K. S. MURRAY then submitted a very comprehensive paper entitled "Industrial Methods of Liquefaction and Practical Applications of Low Temperatures." He pointed out that the time at his disposal would only permit treatment of the subject of the separation of the constituents of air with special reference to low temperature liquefaction. Before dealing with low temperature extraction of oxygen from the atmosphere, Mr. Murray referred briefly to the barium oxide process for effecting the same purpose, as it was undoubtedly by that process, in the hands of the British Oxygen Co., Ltd., that the oxygen industry was founded. He referred to the Brin process, which was taken over by the British Oxygen Co. (then the Brin's Oxygen Co.), and outlined the fundamental changes which had been made to render the barium method of abstracting oxygen from the atmosphere an established success. The improved process was exclusively employed by the British Oxygen Co. for nearly twenty years in their factories, and a number of plants were also erected by them to provide oxygen for industrial applications. There were no barium plants in existence to-day, although in point of economy the process did not compare unfavourably with liquid oxygen plants of the smaller type; it was abandoned mainly because it was incapable of producing oxygen of equal purity. The author then dealt with Professor Linde's rectification process and the British Oxygen Co.'s acquisition of certain rights in this process, and later, of the Claude process for the separation of oxygen and nitrogen from liquid air. He then described the essential features of the Linde and Claude systems. A Linde plant with a capacity of 2,000 c. ft. of oxygen per hour absorbed about 53 b.h.p. per 1,000 c. ft., of oxygen produced. Both Linde and Claude oxygen separators had been manufactured up to a capacity of about 9,000 c. ft. of oxygen per hour. With such plants the power consumed per 1,000 c. ft. of oxygen produced was about 33 b.h.p.

Liquid oxygen could also be drawn from plants producing a gaseous oxygen product, but they were not the most convenient construction for the purpose. The probable extension of the demand for liquid oxygen for explosives was likely to create a demand for plants primarily designed for producing the liquid product.

In recent years, thanks to improved methods of constructing metallic Dewar flasks, the transport of liquid oxygen had become much simplified. In flasks of 25 litres capacity and upwards the loss due to ordinary evaporation should not exceed 5 per cent. in 24 hours. The cost of gaseous oxygen varied with the size of plant employed to a larger extent than in the case of the liquid.

In conclusion, the author stated that the British Oxygen Co.'s plant in this country was now capable of producing 2 million c. ft. of oxygen per day at a price comparing favourably with that prevailing in other countries, with the probable exception of Germany. In the wider fields of industry where the use of oxygen had often been suggested, as for instance in the enrichment of air for blast furnaces, and, in conjunction with steam, for the continuous gasification of fuel, it was doubtful whether the stage had yet been reached when oxygen could be produced cheaply enough even in large plant units to be economically employed. In Germany oxygen was used in the manufacture of nitric acid and acetic acid, but otherwise, neither in that country nor any other, so far as he was aware, had the use of oxygen yet developed to any appreciable extent in the chemical industry.

Leiden Cryogenic Laboratory

A very full description of the apparatus and methods in use at the Leiden cryogenic laboratory was then given by Professor C. A. CROMMELIN.

The purpose of the Leiden cryogenic laboratory, said the author, was to produce *any* temperature below zero degrees, in order to be able to make accurate physical measurements at those temperatures. And the claim was, for accurate measurements at least, a constancy of 0·01° during several hours. The best way to fulfil this claim was to make use of liquefied gases boiling well stirred, under different pressures, and keeping these pressures carefully constant. In Leiden only pressures of one atmosphere and lower (often as low as a few mm., and in the case of helium a few tenths of a mm.) were used, as the construction of cryostates for considerably higher pressures than one atmosphere was difficult and might even present danger. The region of temperatures covered by each substance was therefore the region between its boiling point and its triple point.

Professor Crommelin first explained the different methods used in liquefying the various gases used, and showed how the Leiden regenerative cascade differed from the original arrangement of Pictet. He pointed out that the rather complicated plant of regenerative cycles arranged in cascades had not been built to liquefy air. It had been built to work cryostates with methyl chloride, ethylene, oxygen, and some other gases for physical determinations at all the temperatures from −24° to −217° C. The cascade method of Pictet, which could be so well adapted to the physics of low temperatures, failed below −217° C. The lowest temperature which could be obtained with oxygen, boiling under a pressure of a few millimetres, was −217° C., but this temperature was of no avail for the liquefaction of the next gas, viz., hydrogen, for this gas had a critical temperature of about −240° C.

After describing in detail the operation and construction of the hydrogen plant now being used at Leiden the author stressed the importance of the safety devices which they had adopted in dealing with the hydrogen.

Other points dealt with in detail included descriptions of the helium plant, the construction of a bath of liquid neon, the purification of the neon, the cryostates for liquids, and the hydrogen vapour cryostate.

Dr. J. A. HARKER said that he had been struck by the marvellous dependence of the epoch-making work described by Professor Crommelin upon the extremely delicate and difficult apparatus building that was necessary, and particularly things made of glass. They all knew the difficulty of making one vacuum vessel inside another, but here the total thickness was about that of one's little finger. This apparatus demonstrated the highest manipulative skill in the laboratory.

With regard to Mr. Murray's paper, he did not know whether the academic person realised that quite a lot had been given away in that paper. Mr. Murray was not a person who was easily induced to talk about things which were his "bread and butter," but he knew more than any person in the world about the development of the oxygen industry. He had been hoping that they would have heard another equally interesting industrial authority on oxygen, Mr. Price, the President of the Union Carbide Co. of America, who was at present in London. Mr. Murray had told them one very important thing. They all knew that in the ordinary manufacture of liquid air, Claude adopted Lord Rayleigh's suggestion, and used an expansion engine; but Mr. Murray had told them something very important on top of that. Some months ago he had been discussing the Claude and Linde plants, and Mr. Murray had said that the expansion of energy was rather a talking point in favour of the Claude process. He felt that that summed it up, because since that date he had tested four or five different plants where these things were in use, and in almost every instance the energy recovered from the expansion engine was turned into a resistance coil, where it did no good at all except to warm the room. It was never used as it was figured in the textbooks. Mr. Murray had finished up with a statement of the industrial uses of oxygen, and foreshadowed further uses for it. It was, perhaps, dangerous to prophesy, but he ventured to say that whereas the past 20 years of this century had been a period of advance in industrial chemistry, especially in relation to the fixation of nitrogen, the next 20 years would be a period in which the greatest industrial advance would be in the application of oxygen to almost all industrial problems.

Third Session

The first paper at the evening session was one by Dr. E. GRIFFITHS, who dealt with applications of oxygen in aeronautical work and illustrated and exhibited some of the types of apparatus employed for the purpose.

Manufacture of Hydrogen

The next paper was by M. GEORGES CLAUDE on "The Manufacture of Hydrogen by the Partial Liquefaction of Water Gas and Coke-oven Gas," which was presented by Dr. H. BORNS. The author described his process for the manufacture of hydrogen by the partial and direct liquefaction of water gas and its analogues, and explained modifications which had been made in the original process.

This process had been developed and put into practice in the works of the Grande Paroisse, near Montereau, where an apparatus for the production of 500 m^3 of hydrogen per hour was in operation, feeding a unit for five tons of ammonia per day. The carbon monoxide, containing all the nitrogen of the water gas, was discharged at a percentage which might easily be raised to 85. The hydrogen efficiency was therefore excellent. The carbon monoxide could be utilised either for the manufacture of various chemical products or for driving the internal combustion motors of the installation.

The process required the compression of the gases to degrees, varying with the size of the apparatus from 15 to 30 atmospheres. The first figure applied to apparatus of a capacity of 2,000 m^3 of hydrogen per hour. This process necessitated the command of a relatively high motive power, and one might draw attention to the advantages offered by processes based upon the catalysis of CO into CO_2, such as were, for instance, employed in the Haber process. He had hence only studied and tried this process with a view of its ulterior application to a particularly interesting case, that of the coke oven furnace, in which the presence of a considerable portion of methane rendered catalytic processes inoperative. The complexity of the gas mixtures they had to deal with in this case and the diversity of the freezing points of the constituents might make them fear that they would have to meet serious difficulties in the working of this process. As a matter of fact, however, an apparatus had already been constructed for this purpose, and had, after very short trials, been put successfully to service in the Béthune mines. The essential cause of the success was the very high reciprocal solubility of the diverse condensable constituents. This first apparatus had a productive capacity of 350 m^3 of hydrogen per hour, and it was operating with a compression of about 25 atmospheres. An installation for the utilisation of the hydrogen produced by means of this apparatus in the manufacture of ammonia by the application of hyper-compression had already been erected and was actually being put in working order. M. Claude hoped that this installation would be the point of departure for a much more important installation in which he intended to make use of apparatus for the production of 2,000 m^3 of hydrogen per hour.

Other advantages claimed for the process were described, it being emphasised that one of the characteristic essential features of the process was the extreme smallness of the necessary apparatus. An apparatus for 1,000 m^3 of hydrogen per hour required a sheaf of liquefaction tubes, 40 cm. in diameter and 3 m. in height.

Oxygen in Metallurgy

Mr. COSMO JOHNS, in a communication dealing with the metallurgical side of the production of cold, said that most of the useful metals in present-day practice are extracted from their ores and refined for the use of man by processes which involved the use of atmospheric air for the combustion of carbonaceous matter, silicon, phosphorus or sulphur to provide the heat required. These processes have become standardised to a large extent and are based on the assumption of the invariableness of the oxygen content of the atmosphere. Until Gayley, not so long ago, demonstrated that the seasonal variations in the aqueous vapour content of the atmosphere could be controlled in the air blown into the blast furnace, by refrigeration, it had been assumed that the fluctuating aqueous volume content of the atmosphere was beyond human control in metallurgical operations on a commercial scale. To-day the assumption of invariability in the oxygen ratio of the air used was firmly rooted in the minds of those who were operating metallurgical plants. Obviously the oxygen enrichment of the air used would alter the conditions under which those metallurgical processes which depended on oxidation of some fuel for the heat required were carried out; and though it was difficult to predict what would actually be the effect of such altered conditions, yet enough was known to enable us to say that revolutionary changes in metallurgical practice would result.

It was important to note that it was not pure oxygen that was required. It would be amply sufficient if the oxygen content could be varied between the range of 20 and 40 per cent. The problem is therefore quite different from that of preparing pure oxygen. Dr. F. G. Cottrell had pointed out that air was a mixture of oxygen and nitrogen and that the theoretical amount of energy required for the separation of the two gases was very small, in fact only about 1 per cent. of that required for the production of an equal weight of electrolytic oxygen. What was required was not pure oxygen in steel bottles, but enriched air in hundreds of tons. Owing to the slight difference in density of oxygen and nitrogen it would appear that centrifugal methods for their separation were not very hopeful. Could any refrigerating system be devised which would give oxygen-enriched air at a commercial price? If refrigeration as a method of giving oxygen-enriched air failed us, then the barium oxide or some substance with similar properties required careful investigation.

Complete Separation

Dr. E. B. MAXTED said that with regard to the general question of liquefaction and separation of permanent gases, the first point he wished to touch upon related to the complete separation of air into nitrogen and oxygen. Theoretically, the curve connecting the vapour pressures of a mixture of nitrogen and oxygen with the composition of the mixture was such that separation into pure nitrogen and pure oxygen should be possible. As a matter of fact, in most plants either pure nitrogen or pure oxygen was produced, and there would appear to be openings for plants in which each of the gases was produced in sufficient purity to be used generally. In most cases, both the nitrogen and the oxygen had to be very pure before they were useable, and in cases where one or other of the gases run to waste, it was done fairly universally. It was evident that some sort of modification of the system was required.

Drying of the Gases

The second point he wished to raise related to the drying of the gases. Mr. Murray, in his paper, referred to the methods of drying air or the other gas which was being separated either by chemical absorption or by refrigeration. If a process of refrigeration was employed, it was extremely interesting to notice that the form in which the mixture came down depended upon the temperature gradient, on the temperature itself, and on other conditions. The mixture might either come down as a solid coherent cake of ice or as coherent strands which gradually opened, or as a mass of mobile ice crystals which were easily blown by the gas current into the filter. This last form, of course, was one which was particularly dangerous if the frequent blocking of the drying tube was to be prevented. The final point he wished to mention was the necessity or desirability for the publication of systematic work on the mechanism of heat exchange. In most cases, if we put in a heat exchanger we either guessed the area from previous experience or tried a size which we thought was large enough, and then put in a larger one if it was not large enough. There existed at the present time very little published data relating to the actual rate of the transfer of heat between two gases at different temperatures separated by metallic surfaces. It was not possible to calculate out this rate of exchange from considerations based on conductivity and viscosity because of the nature of the motion of the gas particles, and also because of the formation, particularly at low temperatures, on the exchange surface, of a peculiarly sluggish film of gas which hindered exchange and was very difficult to attack by turbulence of the remainder of the gas. There was, therefore, a very important field for physical research here.

Chemical Industry Club

Fuller Co-operation with the Federal Council

THE annual general meeting of the Chemical Industry Club was held at the Club on Monday, when Mr. A. G. Craig, the chairman of the Executive Committee, presided over a good attendance. Except for some discussion upon a few points of organisation the business was formal, including the re-election of the Hon. Secretary, Mr. H. Edwin Coley, and of the Hon. Treasurer, Mr. C. J. Goodwin. The reports of the Executive Committee and the Hon. Treasurer were both adopted, and certain alterations to rules were approved. The ballot for candidates to fill the five vacancies on Committee resulted in the election of the following: Dr. E. F. Armstrong, F.R.S., Mr. A. J. Chapman, Mr. William Cullen, Mr. C. S. Garland and Mr. T. Miller-Jones.

The report of the Executive Committee made it clear that the Club has well maintained its position during the year. The membership had slightly increased from 690 to 707, and the report referred to various improvements which it had been possible to arrange for the Club owing to its healthy financial position. Special reference was also made to the advancement of the objects of the Club.

The most important work carried out during the past year, the report stated, had been the negotiations with the Federal Council of Pure and Applied Chemistry. Three members of the Federal Council have for some time been co-opted members of the Executive Committee of the Club, and the Hon. Secretary has been a member of the Federal Council. Sir William Pope, K.B.E., Dr. C. A. Keane, and Mr. E. V. Evans were the original representatives of the Federal Council, but since, to everyone's regret, Dr. Keane has been obliged to relinquish most public positions of this kind owing to illness, Dr. S. Miall has been appointed in his place.

This co-operation was further developed during the past year by the formation of an informal body consisting of seven members of the Federal Council and seven members of the Executive Committee of the Club, which will meet periodically and act in an advisory capacity in regard to the progress of the Club generally.

Application has been made to the Executive Committee by the Chemical Engineering Group of the Society of Chemical Industry asking permission to hold meetings at the Club on the evenings of the following dates:—Friday, November 10, Friday, February 9, 1923, and Friday, March 9, 1923. These meetings will be held in the smoking room and the Executive Committee have agreed to permit them.

The Hon. Treasurer's report was equally satisfactory. Notwithstanding increased expenditure, deliberately undertaken to make the Club still more satisfactory, there was a balance in hand of £86 16s. 2d., besides a reserve fund of £100. The substantial nature of the accumulated balance in hand had enabled the Committee to undertake some very necessary painting and cleaning, besides improvements to the billiard table.

Chemical Industry Society's Annual Dinner

The Need of Closer Co-operation

At the annual dinner of the Society of Chemical Industry held in London on October 13, reference was made to the desirability of differentiating between chemists and pharmacists, and to the need of closer co-operation between chemists generally in the best interests of the profession.

THE annual dinner of the Society of Chemical Industry was held at the Connaught Rooms, Kingsway, London, on Friday, October 13, Dr. E. F. Armstrong, F.R.S., President, in the chair. Among the guests were Mr. Roscoe Brunner, the Rev. E. C. Pearce, D.D. (Vice-Chancellor, Cambridge University); Mr. Robert Hicks (Master of the Salters Company); Mr. Charles T. Heycock (Master of the Goldsmiths Company); Mr. W. Hulme Lever; Sir R. Waley Cohen; Mr. Max Muspratt (chairman of the Association of British Chemical Manufacturers); Dr. H. S. Hele-Shaw (President of the Institution of Mechanical Engineers); Mr. A. Chaston Chapman (President of the Institute of Chemistry); Mr. P. A. Ellis Richards (President of the Society of Public Analysts); Mr. A. Gordon Craig (chairman of the Chemical Industry Club); Dr. T. M. Legge (Chief Medical Inspector to the Home Office), and others.

Mr. Roscoe Brunner

Proposing the toast of "The Society of Chemical Industry," Mr. Roscoe Brunner said that although they could have selected a more distinguished person than himself to propose this toast, they could not have chosen a more appropriate one, because his family and business connections with the Society dated from its very commencement. Ludwig Mond, his father's partner, was chairman of the first meeting which started the Society, and his patron saint, Henry Roscoe, was first president of the Society. Incidentally, Henry Roscoe had had something to say about the tonnage of salt which had been decomposed during his first year of office by the Leblanc process, and it was noteworthy that the tonnage of ammonia salt produced in that year was equalled in ten days during the palmiest days of the ammonia soda process. That showed how the world had progressed.

Status of the Chemist

He ventured to say that the Society of Chemical Industry had done more to raise the status of the chemist than any other agency since its foundation. He could claim to have been connected with the chemical industry since 1874, and in those days the elder members of the Society would remember that a chemist who had not been educated somewhere on the Continent was not considered worth his salt, but we had progressed very far since then. The scientific education of this country was certainly better than the scientific education in any other country in the world. Even Oxford now had a very brilliant scientific school, and even speaking in the presence of so distinguished a member of the University of Cambridge as its Vice-Chancellor, he ventured to say that Oxford had a reputation as a school of chemistry second to none in the whole world. He hoped that the Society would continue to press for the better standing of the chemist. In his opinion it was improper that the scientific man who had studied chemistry should be classed with the pharmacist, and he hoped that the Society would take such steps as were possible to give the chemist that standing in the world that he possesed in the opinion of those who were qualified to judge him. What steps the Society could take to that end, he confessed he did not know. He wished long life and prosperity to the Society of Chemical Industry.

Dr. Hele-Shaw

Dr. H. S. HELE-SHAW (President of the Institution of Mechanical Engineers) supported the toast, and said that he felt quite at home in a gathering of chemists, because of the close relationship between the work of the chemist and the engineer. He was, moreover, happy to be in the company of the sons of two men who had done so much for chemistry and engineering. Sir John Brunner was one of the greatest friends of all professors and a generous host. When they wanted advice, assistance, and sometimes pecuniary assistance, they knew where to go, and never came away empty. Mr. Max Muspratt, who was present, was the son also of a man who had always assisted the universities.

The objects of the Society of Chemical Industry and the Institution of Mechanical Engineers were identical in their respective industries and everyone knew how the chemists and engineers had come together and were jointly responsible in aiding and backing up and making a success of the noble efforts of the fighting line during the war. It was admitted that the engineers and the chemists did not fail when the crisis came. All these things made him, as an engineer, feel at home in a gathering such as this. The chemist of to-day was not the chemist of the old days. Times had changed; the picture of the old chemist was that of a venerable man with a long beard down to the ground; a man who worked in a very dark and mysterious place, with, perhaps, a long tall hat on his head, something like a fool's cap, with various retorts and furnaces all around him. That was the old idea of the chemist but, like the old idea of an engineer, that had passed away. The chemical works of to-day had its furnaces and retorts but—and the engineer recognised this—there was a great development of engineering appliances in the chemical works of to-day, and it was this which constituted a great bond of union between the chemist and the engineer. Engineers and chemists must co-operate, and it was that co-operation which formed the strongest bond of union between them.

In another respect the Society of Chemical Industry and the Institution of Mechanical Engineers had an interest in common, and that was, they both issued journals. The ably edited Journal of the Society of Chemical Industry aimed at giving the latest information, just as the Journal of the Institution of Mechanical Engineers tried to do, of what was going on all over the world. The Institution of Mechanical Engineers had just celebrated its 75th anniversary, and had a membership of 10,000. The Society of Chemical Industry was in its 40th year, and had a membership of about 6,000, a figure which the Institution of Mechanical Engineers reached ten years ago. He hoped that in another ten years the Society would have a membership equal to that of the Institution of Mechanical Engineers and that it would continue to progress and flourish. It was with these aspirations that he had much pleasure in supporting the toast.

Dr. E. F. Armstrong

THE PRESIDENT (Dr. E. F. Armstrong), replying to the toast said that in the old days chemistry was a very formal science, chemists were very formal people, and they used to have very formal dinners, and sit at long tables. However, everything had changed now. Formality had gone by the board, and ladies now appeared at their functions. It was, indeed, the desire of the Society that the proceedings should be as informal as possible and that everybody should enjoy themselves. It we endeavoured to take a broad view of the present as compared with the past, it was instructive to cast our eyes right back to ancient Egypt, to ancient Greece, and to the wonderful Roman Empire, and to reflect in what way we differed from the men and women of those times. Had we progressed in Art? He thought the answer was No. Had we progressed in Literature? The answer was No. Had we progressed in Government, whether State or Imperial? Had we progressed or were our methods not founded on those of the ancient Empires? Wherefor did we differ in this age? Was it not because of mechanics and mechanical inventions? This was a mechanical age, and all the changes which had taken place, producing greater comfort, let us claim, and producing the world as we now know it, were due to the brains of man evolving mechanical aids for his well being.

The Handmaid of Chemistry

The theme that he wished to elaborate for a moment was that whilst we used the term "mechanical" and thought of the mechanical inventions, was it not the chemist who made these discoveries, and the engineer who had taken the credit? (Laughter.) Ought not it to be asserted at meetings such as

this that the engineer was but the handmaid of chemistry, and that the engineer was but the kindly gentleman who carried out in the world the ideas which the chemist had wrested in the laboratory? What they wanted to drive home was that the engineer—who he believed originally was a Scotsman—was a very canny man. They had just been told that 35 years before the chemists, the engineers got together and formed a society, and the moral they had to learn was that the engineers got together and as a consequence of that they got the ear of the public and the credit, and well they deserved it, because surely the prize was to the swift. Chemists did not seem to have been swift enough. Take the social services which were so essential for the public. In the case of the water supply of the great city of London, which was the outstanding name? He believed it was the name of Sir Edward Frankland, but who really got the credit for the water supply of the city of London? It was one or other of their friends the engineers. The same thing applied to sewage, and it was the chemist who had made the discoveries which had rendered it possible to live in our large cities, but it was the engineer who had reaped the reward, both materially and in the shape of knighthoods and the like.

Chemists' Excess of Modesty

There was something about the chemist which was hard to define. Chemists seemed to suffer from an excess of modesty, and if they were to reach that standard of excellence in the world and to have that weight in the counsels of the nation they should have and which they had earned, something must be done to put this state of things right, and the only advice he could give them that evening was advice based on the words of the President of the Institution of Mechanical Engineers, and that was, to keep on getting together. The chemists were only 4,000 or 5,000 or 6,000 strong so far as the Society of Chemical Industry was concerned; let them get together and become 10,000 in a very short time. Let them grow the 35 years older that had been mentioned in order to get a membership of 10,000, but let them quicken the process. He believed that an increase of temperature of about 10 degrees doubled the rate of chemical re-action, and possibly some of the chemists would engender a little heat. There were various ways of producing heat, and if they did this, then they would get their 10,000 members in quicker time than the 75 years which he understood had been allotted to them.

Activities of the Society

Passing to another theme, the President said that the Society was unique in that its activities were world wide. It had sections, not only throughout the British Empire, but even firmly planted in the very heart of the United States. Two Presidents had been citizens of the United States, and the point he wished to make was the essential importance both to the welfare of Anglo-Saxon chemistry, and also to the welfare of civilisation on this globe, that British and Americans should stand firmly together at the present juncture. If any of them had sufficient leisure to reflect upon the future of civilisation they could not help having a fear, at the present time, for the future of civilisation as we know it. The world was upset. The East was in a ferment, and Great Britain had the greatest enemy she ever had in her history in the Bolshevik. At the present time we alone stood in the breach between Bolshevism and the wreck of all that we held dear. It was a great pity that America did not understand that fact, and had not yet come to our assistance. If any of them had had the advantage of going to America they would realise that what was called America was not America. America was controlled politically by the inhabitants of what was known as the Middle West, and those people lived so far from the sea that they did not understand the problems of Europe. Some of the enlightened men in America, and particularly enlightened chemists, realised the danger, but as chemists we must make our brother chemists in America alive to the fact that the situation menacing civilisation was a grave one. We must co-operate as chemists so that we had an Anglo-Saxon chemistry.

A Duty to Civilisation

The first steps in that direction had already been taken, for the Society of Chemical Industry was almost a pioneer and unique in having an American Section, but he felt that a message should go forth across the seas on the occasion of a meeting like this to tell our American friends that there were duties bigger than national duties; they had a duty to civilisation. (Hear, hear.) The time had come when chemists must hang together if they were to go forward, and they must put the interests of their profession before themselves. It was on that theme that he would like to thank Mr. Roscoe Brunner and Dr. Hele-Shaw for the kind words they had said about the Society, and to express the hope that the chemists could rely upon the support of the great and successful manufacturers, and their friends the engineers.

Mr. Thompson and the Rev. E. C. Pearce

Mr. EDWIN THOMPSON proposed "The Visitors," and in mentioning their names, said the Society looked forward with tremendous pleasure to being the guests of Cambridge at the next annual meeting.

The Rev. E. C. PEARCE (Vice-Chancellor, Cambridge University), who replied, said that although, as Mr. Roscoe Brunner had said, Oxford University might have a school of chemistry second to none, he noticed that the Society was not going to Oxford for its next annual meeting. (Laughter.) Speaking of the applied chemist and the pure chemist, he said that in Cambridge they had a very great respect for the applied chemist because he had done a great deal for the University, and was going to do much more for it. Some of them might know that the oil firms a little time ago gave the University 200,000 guineas, because they realised what pure chemistry in Cambridge was doing for them. The University very much appreciated the action of the oil firms and wished that other firms would do the same, because they were all very poor in Cambridge. That was really no laughing matter because the salaries for which people who were worth very much more were working in Cambridge would surprise those present if he were to mention them. That, however, was rather a domestic matter, and on behalf of the Visitors he wished to say that if the Society enjoyed itself in Cambridge at its next annual meeting as much as he had enjoyed himself—and he was sure the other visitors too—at that dinner, the University would be more than repaid.

Symbolic Rubber

THE second meeting of the session of the Manchester Section of the Institution of Rubber Industry was held at the Midland Hotel on Monday, Mr. H. W. Hatton presiding. Mr. D. F. L. Zorn (chairman of the Rubber Shareholders' Association) read a paper on the above subject, in the course of which he explained that he referred to "symbolic rubber" in the sense of using a piece of indiarubber for the purpose of erasing pencil marks, or, to apply other words, the rubbing out of ideas and views that were unsound. In this sense he dealt with, among other subjects, the attempted creation of watertight compartments in industry, and the hoarding of "business secrets." He understood that it was claimed by the American manufacturers that in respect of manufactured rubber they were able to supply goods which in finish, and especially in colour, were far ahead of the rubber products of any other country. He would like to know whether there were good grounds for that claim, and if so, what was the explanation? Could the English manufacturer turn out coloured goods of as high a class as the American? If not, could any of their chemists tell them the reason?

Canadian Mineral Output in 1922

THE total estimated value of the mineral production of Canada during the first six months of 1922 was $57,682,944, of which $26,475,544 represented the value of the metal production and $31,207,400 the non-metals. As compared with the same period of 1921, the value of the metals has increased about $2,000,000, or about 9·1 per cent. The ten principal products of the mineral industry in Canada during the period under review are classified as follows: Coal, $24,346,959; gold, $12,110,242; silver, $5,997,199; lead, $2,882,047; natural gas, $2,448,829; copper, $2,337,093; asbestos, $1,894,232; nickel, $1,401,820; zinc, $1,370,460; and salt, $849,133. Excluding the value of natural gas, the total value of these commodities during the period was $52,340,052, as against $59,615,309 during the first six months of 1921. The decrease amounted to 12·2 per cent., and was due largely to the slackness in shipments of coal and the weakness of the nickel and copper markets.

The Preservation of Iron and Steel

Functions of the Perfect Pigment

In his Presidential Address to the Oil and Colour Chemists' Association on Thursday, October 12, Dr. J. Newton Friend dealt mainly with experiments he has carried out in regard to the preservation of iron and steel from corrosion and rust. As illustrating the importance of the subject, he referred to the estimate made by Sir Robert Hadfield that 28 million tons of steel are lost annually by corrosion, and said that if we took an average of £20 per ton, the monetary loss amounted to nearly £600,000,000 per annum. Dr. Friend added that he knew a Midland firm which had calculated that the painting of their works worked out at £1 per ton of metal surface painted per year, and as there were 10,000 tons of metal the annual cost of painting was £10,000. As the painting had to be done every year, that meant a loss of that sum annually. Hence the subject of preventing the rusting and corrosion of iron and steel had become one of supreme economic importance. It was pointed out that iron does not rust in dry air; in water only; in moist air at constant temperatures, nor in steam, provided the steam was not superheated. If the presence of liquid water could be prevented, then rusting would be prevented to a very large extent.

Dr. Friend then dealt with the results of the experiments he has carried out at Birmingham and Worcester in conjunction with his students and also alone. A number of mild steel plates, charcoal annealed and thoroughly cleaned were painted with a definite quantity of paint and were exposed to the air in the form of a fence in the Valley of the Severn. Altogether, the plates were exposed for five years, but they were examined at various periods, and, as showing the difficulties encountered in the study of corrosion effects, it was stated that the loss after one month in the case of five precisely similar plates was quite different. In the case plate No. 1 the loss was 1·55 grams; plate No. 2, 1·25 grams; plate No. 3, 1·35 grams; plate No. 4, 1·60 grams, and in the case of plate No. 6 the loss was 3·95 grams. In all series of plates it was found that there was one which was more erratic in its behaviour than the rest, and Dr. Friend suggested that it was due to some physical or chemical difference. The possibilities of error in making these experiments were set out as impurities in the metal, variation in the weather, positions of the plates, application of the paint, extent of corrosion, and the method of weighing.

Chemical Composition of Linoxyn

Discussing the functions of a perfect vehicle, Dr. Friend said it should protect the painted surface, bind the pigmentary particle and expand and contract with the painted surface. As regards linseed oil as a vehicle, this rapidly absorbed oxygen, giving a clear substance known as linoxyn, the chemical composition of which was still a matter of discussion, but it was this fact which gave linseed oil its good properties over any other vehicle. If linseed oil were a perfect vehicle it would not allow moisture to penetrate the linoxyn. It was a disadvantage that linseed oil should be slightly porous, and in order to see whether the porosity could be reduced, some experiments were carried out which led to the conclusion that if linseed is heat-treated to get polymerisation, it is possible to reduce the porosity.

Passing on to the perfect pigment, the functions of this were detailed as follows:—Mechanical support to linoxyn, reduction of paint permeability, increase of viscosity, and reduction of the amount of expansion on setting. Dr. Friend said he did suppose there was a perfect pigment, although a greater degree of perfection had been reached in this than in oil.

Effect of Colour on Durability

Experiments had been made upon the effect of colour of the pigment upon the durability of a paint. The experiments were with red, black and white pigments, and it had been found that in daylight the effect was different from that which was obtained in the dark. In the dark all three behaved similarly, but in the light oxidation was very much more accelerated in the case of white. It was obvious from these experiments that colour had a great deal to do with the disintegration of paint once it had been applied. The nearer we got to the red end of the spectrum, or the black, the longer was the paint likely to last.

Another important point was the fineness of the pigment. The physical properties of a pigment were largely influenced by the state of subdivision, and the finer the pigment the more thoroughly would it become incorporated with the oil. The best paint could be expected when the pigment was finest, generally speaking; but there were other things to be considered. The pigment might lose body as it became exceedingly fine, and the cost of grinding might become disproportionately large after a certain diameter of particle had been reached. His experiments showed that after a pigment had been ground to a good commercial quality—say 200 mesh—then it had reached a very efficient state of subdivision, and very much finer grinding would only affect the paint to a small extent. As to the effect of variation of pigment percentage, the best result appeared to be obtained with 60 per cent., which was about the percentage which practice had found to be best, and it seemed that by accident rather than otherwise, painters had hit upon the best proportion for a mixture for painting steel. The pigment had got a maximum concentration for which it gave the best results with linseed oil. His experiments had also shown that several thin coats of paint retard corrosion better than one thick coat, a fact which supported the old idea that two thin coats are better than one thick one, although the painters did not think of corrosion when they adopted this plan. Actually, the best results were obtained with one thin coat and one thick coat of paint so far as prevention of corrosion of steel was concerned. Whereas, however, in the case of surfaces exposed to the air an increase in the total thickness of the paint prevented corrosion, as common sense would suggest; with sub-aqueous surfaces there was an optimum thickness of paint, after which corrosion increased enormously. That optimum thickness was about 7 to 9 lb. per 100 square feet in the case of the sub-aqueous tests that he had made. Finally, reference was made to the effect of leaving mill scale on steel as a means of preventing or retarding corrosion. Although mill-scale was a means of preventing corrosion, the point was that in making up steel, the scale was broken in various places, and moisture got in at these places and set up corrosion.

Discussion

In the course of a short discussion, Mr. Noel Heaton commented upon the effect of colour, as mentioned by the President, and suggested that this was an aspect of the matter upon which further work ought to be done. At the present time there was a great vogue for painting outside work, so far as buildings were concerned, with white paint and light stone colour paint, but, from what had been said, these were the worst possible colours from the point of view of durability. It seemed that a pale pink ought to be adopted instead of white or stone colour, although this might not be very nice from the æsthetic point of view. Possibly we might get used to it. The next best colour for the purpose might be grey, but there was enough greyness about London, Birmingham and similar places through the dirt that so quickly covered the surfaces of buildings. With regard to mill scale, it was the fact that it formed a perfect protection against corrosion, but if it were left on for that purpose difficulties were introduced for the reason mentioned by the President.

Mr. W. J. Palmer remarked that a lot had been said and heard about the wonderful results obtained with the Plauson mill and similar types of mill for grinding pigments, and he understood that it was possible to get pigment to such a consistency that it was in a state of colloidal suspension. In other words, there was no separation of the pigment and the medium. He would like to know the figure of fineness of grinding that would give that effect, and also whether there was any marked degree of improvement in the effect from the point of view of corrosion. With regard to the effect of colour, the dye used might have a certain influence in itself apart from the pigment, and there was also the question of the dye being introduced to the medium without the pigment. Had the lecturer any information as to whether the dye had any influence upon the drying and oxidation properties of the film of paint?

Mr. Thorpe, speaking with regard to mill scale on the steel used for bridges, agreed that the danger of corrosion came from the fact that the covering of scale was not complete, owing to rivet and bolt holes. If the covering of mill scale could be kept complete nothing better could be desired.

With regard to the general specification of paints, he favoured a weight per gallon being specified, so that the painter's pot could be taken at any time and the contents weighed, in order to ascertain that the correct paint was being used.

Mr. A. E. DE WAELE said he noticed, from a diagram which the President had shown, that a white pigment dried more slowly in the dark than the red pigment, and one would hardly have expected the colour of the pigment to have come into play at all in the absence of light.

Mr. DAMPNEY, speaking with regard to scale, said it was generally conceded that in the case of bridges, if the mill scale was left on, it formed a good protection, but in the case of ships' bottoms the reverse was the case. It had been said that mill scale, in an electrolyte, was anodic to the portion to which it was attached. He would like to know if that were so.

Dr. Friend's Reply

Dr. FRIEND, replying to the points raised, said that it was questionable whether the dye had any effect or not upon the drying and oxidation properties in the case of steel. In the experiments he had mentioned he was inclined to think that the dye had a very minor effect, and the colour the major effect. Mill scale was usually cathodic, and there was usually bad corrosion on ships' bottoms if any mill scale was left on. He did not think it would be possible to build a ship with continuous mill scale, and therefore it was necessary to remove every bit of it, and give the ship a good coat of paint.

Society of Dyers and Colourists

Opening Meeting of the Manchester Section

THE Manchester Section of the Society of Dyers and Colourists held its first meeting of the session, on Friday, October 13. Mr. Pennington moved a vote of thanks to the retiring chairman, Dr. Knecht, for his services to the Section during the previous two years, and this was seconded by Mr. Hannay, and carried unanimously.

The newly elected chairman, Mr. William Marshall, F.I.C., then took the chair, and delivered his inaugural address.

"The Dyeing and Finishing of Ramie"

In his address on the above subject, Mr. Marshall said that the ramie fibre was again exciting considerable interest in many parts of the world, and dyers would probably be called upon to handle large quantities of it in the near future. He thought it might be of interest to members of the Society if he brought to their notice some results which he obtained in March, 1919, and at subsequent dates. He then gave a brief résumé of the preparation of the fibre previous to the dyeing process and the finishing process, showing specimens from the different stages of such preparation.

China grass, ramie, or Rhea belonged to the natural order *urticaceæ*, and hence was not a grass at all, but a species of nettle somewhat resembling in appearance and habits of growth the common nettle of Europe. It was, however, a stingless, or shooting, nettle of the sub-division *Baehmeria*. There were many varieties of the plant, but only two species of interest for their fibre-yielding properties—namely, (1) *Baehmeria nivea* (white-leafed ramie), which was first known and cultivated from time immemorial under the name of *Tchou Ma*, and (2) *Baehmeria tenacissima* (green-leafed ramie), known in India as Rhea, and in the Malay Islands as Ramie. Attempts to utilise the ramie fibre in this country dated back to the year 1814.

After the plants were cut down, the first process was the removal of the outer bark, and the separation of the bast fibres in the form of ribbons, which were then hung up to dry. A small portion at the heart of the plant was waste, as it was pithy and useless. In China the stems as soon as cut down were soaked in water and the bark scraped off by native women and children with a knife or ring, or the fingers, the bast fibres being cleaned and dried in the sun. The product was the China grass of commerce. A mechanical method of decorticating would be of immense value, and the inventors, stimulated by the offer of the Indian Government in 1869 and 1889 of a prize of £5,000 had devoted a great deal of attention to the subject, both in Europe and America.

According to the last report of the British Cotton Industry Research Association, they had some 300 cotton plants at the Shirley Institute, Didsbury, and he (Mr. Marshall) intended to suggest to the Association that it would be useful to add a few ramie plants to their collection, so that engineers might study at first hand its properties and work out the problem of cheap and satisfactory decortication.

Removal of Impurities

Most of the impurities were removed in the degumming process, and the resulting product was practically cellulose, almost identical in chemical constitution with bleached cotton and linen. The degummed fibre had most valuable properties.

Ramie could not be expected to take the place of ordinary cotton goods on account of its price, but for specialities and novelties there might be many openings where its valuable properties could be utilised. A good illustration of this was found in the manufacture of incandescent mantles, which were first made from cotton yarn. These were not satisfactory as regards luminosity, and had a tendency to break. Ramie was tried, and was now the principal yarn from which mantle fabrics were knitted and woven. Before the war large quantities were imported from Germany, the British makers only being able to produce a small percentage of the mantle manufacturers' requirements. The deficiency had now been made good, and British spinning plants which had rendered the country self-supporting in this respect were also able to meet all inquiries for other purposes. Mantles made from China grass had a higher and better maintained illuminating power, and were more capable of withstanding shock.

Dyeing Properties

Mr. Marshall then dealt with the dyeing properties of ramie; in view of the many contradictory statements which had been published about difficulties in dyeing and fastness to light and washing. His results were conclusive that ramie was equal in all these points to cotton and flax. Direct, basic, developed, sulphur, vat, indigo, turkey red, anilin black, para red, and azoic dye-stuffs were used, and comparisons between cotton, ramie and flax were exhibited. Specimens of cloth in various finishes made from ramie and mixtures in both the mercerised and non-mercerised states were also shown in white, colours, and prints, and were characterised by their softness, lustre, and silky appearance.

In concluding his address, Mr. Marshall referred to the export of ramie from China and the enormous demand for it from Japan, which was now taking something like 90 per cent. total quantity from China. This, of course, meant that the world was getting 10 per cent. This was a most unsatisfactory state of things. If the manufacture of ramie fabrics was to be successfully accomplished in this country it could only be by the application of the best technical skill, and the close and hearty co-operation of the Lancashire manufacturers with spinners, dyers, and finishers. In his opinion, there was no reason why Lancashire should not produce from ramie many novelties which would have a ready sale in the markets of the world.

Definition of Commercial Limes

THE American Society for Testing Materials has adopted the following definitions of commercial limes: Quicklime is a calcined material, the major part of which is calcium oxide, or calcium oxide in natural association with a lesser amount of magnesium oxide, capable of slaking with water. Hydrate of lime is a dry powder made by treating quicklime with enough water to satisfy its chemical affinity under the conditions of its hydration. It consists essentially of calcium hydroxide, or a mixture of calcium hydroxide and magnesium oxide and magnesium hydroxide. Other limes are classified on the basis of the alkaline-earth xide ration as calcium and magnesium limes. Calcium lime contains 85 per cent. or more total CaO, and magnesium lime is one containing more than 10 per cent. MgO. When the CaO content is very high, the product may be called high-calcium lime, and when the MgO content is considerably above 10 per cent. it may be called high-magnesium lime. It would appear, therefore, that commercial limes may be divided into four categories: Quicklime, hydrate of lime, calcium lime, and magnesium lime. The two latter can be subdivided into ordinary and high.

September Trade Returns

£71,000 Improvement in Chemical Exports

ACCORDING to the Board of Trade Returns for September the exports of chemicals, drugs, dyes and colours, valued at £1,733,883, were £71,274 more than in the preceding month, while imports, at £1,032,511, record a decrease of £92,510. As compared with September 1921 the export total for the month under review is £361,030 more, and imports are £48,481 more.

Imports of Chemicals

A comparison between quantities imported in September and August of this year respectively, points to increases under calcium carbide, glycerin, potassium compounds, and bleaching materials; and decreases under borax, tartaric acid, sodium compounds, cream of tartar, and zinc oxide.

The detailed import figures, in cwts., unless otherwise stated, are given below with the August figures in parentheses. INCREASES: Acetic acid (including acetic anhydride, 528 tons (507); bleaching materials, 4,815 (3,410); calcium carbide, 59,043 (21,421); crude glycerin, 6,346 (3,485); distilled glycerin, 593 (361); red lead and orange lead, 3,629 (2,206); potassium nitrate (saltpetre), 24,343 (16,147); and potassium compounds, other than nitrate, 361,446 (195,248). DECREASES: Tartaric acid, including tartrates, not elsewhere specified, 3,821 (5,707); borax, 3,003 (7,399); sodium nitrate, 106,755 (128,681); sodium compounds, other than nitrate, 16,108 (128,681), cream of tartar, 3,081 (3,736); and zinc oxide, 501 tons (502).

Recovery in Sodium Compounds

One of the features of the export side is the recovery noticeable in the shipments of sodium compounds. Tar oil, creosote, etc., bleaching powder and benzol and toluol also show substantial improvements. Sulphate of ammonia business was only 224 tons in excess of the August figure. Of the September total of 14,873 tons, of the declared value of £249,393, Spain and the Canaries took the largest proportion, *i.e.*, 6,781 tons. France came next with 3,803 tons, and was followed by the British West Indies with 441 tons; Italy, with 205 tons; and the Dutch East Indies, with 149 tons; no imports are recorded against Japan. Other countries, which are not enumerated, took 3,494 tons.

Decreases are noted in exports of sulphuric acid, naphtha, anthracene, copper sulphate, glycerin, potassium compounds and zinc oxide.

The following figures show in detail the products the September exports of which were larger (as to quantity) than in the preceding month; the August figures are given in parentheses and the figures represent cwts., unless otherwise stated: Tartaric acid, including tartrates not elsewhere specified, 757 (321); ammonia chloride (muriate), 775 tons (444); sulphate of ammonia, 14,873 tons (14,649); bleaching powder, 24,376 (10,713); benzol and toluol, 4,048 gals. (.658); carbolic acid, 19,907 (19,091); naphthalene, 3,800 (2,758); tar oil, creosote, etc., 3,701,914 gals. (2,076,635); coal tar products, not elsewhere specified, 31,130 (23,844); sodium carbonate (including soda crystals, soda ash and bicarbonate), 461,227 (311,739); and sodium sulphate, including saltcake, 185,235 (35,495).

The decreases, similarly compared, are: Sulphuric acid, 1,020 (1,377); anthracene, nil (47); naphtha, 1,446 gals. (2,084); copper sulphate, 554 tons (869); crude glycerin, 266 (1,336); distilled glycerin, 8,408 (8,927); potassium chromate and bichromate, 1,153 (2,103); potassium nitrate, British prepared, 881 (1,155); potassium compounds, other sorts, 1,754 (1,988); caustic soda, 120,791 (134,816); sodium chromate and bichromate, 2,059 (5,331); sodium compounds, other sorts, 48,099 (58,714); and zinc oxide, 209 tons (332).

Dyes and Dyestuffs

There was a further general increase in the importation of dyes during the month under review. Twice the quantity of intermediates imported during the past nine months, was brought into the country; the quantity was 6 cwt. of the declared values of £106, as compared with 4,868 cwt., valued at £80,768, imported during the corresponding month of 1920. In September, 1921, there were no imports under this heading.

The comparative figures for September and August this year are: Coal tar intermediates, 6 (2); alizarine 1,059 (522); synthetic indigo, nil (nil); finished coal tar dyestuffs, other sorts, 5,071 (3,252); cutch, 2,214 (6,389); extracts for dyeing, other sorts, 7,940 (9,265); natural indigo, 80 (117); and extracts for tanning, 52,934 (82,002).

Exports of dyes and dyestuffs were 2,541 cwt. more than the August shipments. The total of 9,506 cwt. (as against 6,965 in August), made up of 4,993 cwt. of coal tar products (as against 2,868), and 4,513 cwt. of other sorts (as against 4,097), was valued at £52,763, whereas the previous month's exports amounted in value to £54,463.

Painters' Colours and Materials

Importers of painters' colours and materials, with the exception of white lead, were lower, while exports were 2,236 cwt. in excess of the August total. The comparative figures are:—IMPORTS: Barytes, ground, 63,237 (70,909); white lead (basic carbonate), 9,835 (8,496); painters' colours and materials, other sorts, 49,044 (59,496). EXPORTS: Barytes, 4,903 (3,835); white lead, 17,289 (20,669), paints and colours, ground in oil or water, 15,750 (16,526), paints and enamels prepared (including ready mixed), 17,085 (18,199); other sorts, 45,580 (39,142).

Scientific Instruments and Glassware

Scientific glassware (except tubing and rod), was imported to the value of £5,413, as compared with £5,118 in August, while 131 cwt. of glass tubing and rod, valued at £707, were imported as against 333 cwt. of the value of £1,154, imported in the preceding month. Exports of tubing and rod totalled 118 cwt., as against 21 cwt. shipped in August. Exports of scientific glassware other than tubing and rod amounted in value to £6,123, as compared with £4,834. We imported 92,345 gross of glass bottles and jars as against 111,666 gross, and exported 32,121 gross as compared with 33,993 gross.

Scientific instruments and appliances (except electrical) were imported to the value of £32,703, against £38,357, while the exports under this heading totalled £68,971 as compared with £66,294.

Soapworkers' Wages

Protest against Proposed November Reductions

AN all-London conference of representatives of the Soap and Candlemakers' Section of the National Union of Distributive and Allied Workers was held at Anderton's Hotel, Fleet Street, on October 15, to consider a further proposal of the employers in the industry to reduce the wages of the men workers by 4s. a week and the women workers by 2s. a week from the first week in November. Officials were instructed as to what attitude they should take up at the next meeting of the Joint Industrial Council of the industry called for Thursday, when the proposals for the reductions were to have been put forward.

Commenting on the situation a union official said "the conference demonstrated its keen resentment at the frequent reductions imposed upon the soap- and candle-makers without any justification. The workpeople feel that their standard of living is far too low, and that the industry, which is almost entirely immune from foreign competition, is well able to pay higher wages than they are paying at the present time."

Similar meetings were held in different parts of the country, including Liverpool, Birkenhead, Manchester, Bristol, Glasgow, and Leeds. Headquarters have received communications from most of the branches protesting against the proposed wages cut.

Bowie-Gavin Cracking Process

MR. C. P. BOWIE, petroleum engineer of the U.S.A. Bureau of Mines, assisted by Mr. J. S. Desmond, is continuing, at the San Francisco office of the bureau, the development of the Bowie-Gavin cracking process for the refining of heavy crudes, tarry substances, and residuals that are difficult to treat by other methods. Experiments are being performed to study the possibility of converting the residual carbon into producer gas, which, together with the fixed gases from the still, may be used as fuel for operating the plant. Mr. Bowie is preparing a bulletin on the cracking process, which will contain drawings of the apparatus and will describe the experimental work in detail.

From Week to Week

Mr. H. R. Pitt, of Wakefield, has been elected President of the West Riding Metallurgical Society.

Cory Brothers and Co., Ltd., of Cardiff, are stated to have placed contracts to the value of £70,000 for the erection of oil storage tanks at some of their principal depôts.

As the result of the declaration of a dividend of 300 per cent., the shareholders of the Vacuum Oil Co. will be asked to approve a plan to increase the company's capital by 400 per cent.

The Council of the Chemical Society has elected Professor J. F. Thorpe to succeed Dr. M. O. Forster as hon. treasurer, and Dr. J. T. Hewitt to fill the vacancy so created in the list of vice-presidents.

Councillor S. Sadler, a director of Sadler and Co., Ltd., manufacturing chemists, Middlesbrough, who has been a member of the town council for about sixteen years, is the Mayor-elect of Middlesbrough.

Until recently works manager to the British Oil and Cake Mills, Ltd., at Strood, Rochester, Mr. G. Wise has received an easy chair from the staff. Mr. Wise had been connected with the Strood Mills for twenty-seven years.

It is understood that the Distillers Co., Ltd., has completed a deal with American capitalists regarding their yeast output. After prohibition the Americans endeavoured to make yeast from ingredients other than alcohol, but failed.

At the Institution of Mechanical Engineers, Storey's Gate, Westminster, on October 26, Sir William H. Bragg, F.R.S., in conjunction with Professor W. L. Bragg, F.R.S., will deliver a lecture entitled: "The Significance of Crystal Structure."

Mr. C. S. Garland, managing director of Lighting Trades, Ltd., and a prominent member of the Chemical Engineering Group, has been adopted as Conservative and Unionist candidate for South Islington in place of Sir Charles Higham.

A petition for the winding up of the Premier Briquette Co., Ltd., was mentioned to Mr. Justice Lawrence on Tuesday, when it was stated that the parties had agreed to the matter standing over for a week. His Lordship granted the adjournment.

The Professor of Chemistry at Cambridge University has appointed Mr. F. G. Mann, of Downing, as his assistant. Mr. N. J. T. M. Needham, B.A., of Caius, has been elected to the Benn W. Levy research studentship in Biochemistry for one year as from July 1 last.

The successful candidates in Science in the London University Senatorial Election were Dr. George Senter, 813 votes and Mr. C. W. Crook, 477. The remaining candidates received the following votes: Dr. Bridges, 321; Mr. Humberstone, 309; Dr. Jessie White, 191.

Mr. George George, F.I.C., who for the past twenty years has been Director of Technical Education, Auckland, New Zealand, and was previously headmaster of the Sutherland Technical Institute, Longton, Staffs, has been appointed Technical Editor of the *Sydney Daily Telegraph*.

At a banquet at the Hotel Astoria, New York, last week, Mr. F. E. Hamer (editor of The Chemical Age) presented messages of greeting to the Anglo-American business press conference from Earl Balfour, Lord Robert Cecil, Lord Burnham, Lord Riddell, Sir Ernest Benn and Mr. C. P. Scott.

A general meeting of the members of the Newcastle-on-Tyne section of the Society of Chemical Industry will be held in the Chemical Lecture Theatre, Armstrong College, on October 25, at 7.30 p.m. The Chairman (Mr. A. Trobridge) will deliver an address entitled "Fifty Years of Chemical Industry."

Mr. C. F. V. Blagden, son of Mr. and Mrs. Victor Blagden, of 48, Upper Grosvenor Street, London, was married on October 12 at St. Mark's, North Audley Street, to Vera Mary, daughter of Mr. and Mrs. Sydney Grinling, of "The Chestnuts," Harrow Weald. After a reception at Claridge's Hotel, the bride and bridegroom left for Italy and the South of France.

The Master and Fellows of University College, Oxford, have elected Mr. Edmund John Bowen, B.A., late scholar of Balliol College, to a fellowship and pro-electorship in chemistry. Mr. Bowen, after service in the war, obtained first-class honours in Natural Science in Trinity Term, 1920, and has been lecturer in chemistry in that college for some two years.

At the opening meeting of the Huddersfield Technical College Chemical Society on October 13, Mr. S. Robson dealt with the "Purification of Gases from Dust." The lecturer gave instances where a dust free atmosphere was essential, as in the manufacture of margarine and other foods, and described the general methods adopted in chemical and other works for the removal of dust.

The funeral of the late Mr. J. Cooper, managing director of Cooper, Liversedge and Wood, Ltd., Nieley Dyeworks, Honley, Huddersfield, took place on October 11, at the Edgerton Cemetery. He had been president of the Huddersfield Master Dyers' and Finishers' Association, and vice-president of the Society of Dyers and Colourists. Mr. Cooper leaves a widow and one son.

The Board of Trade announces that, following upon the resignations of Sir Harry V. Kilvert, Mr. G. W. Currie and Dr. M. O. Forster, F.R.S., F.I.C., from the Dyestuffs Advisory Licensing Committee, which was originally set up in January, 1921, pursuant to passage of the Dyestuffs (Import Regulations) Act, 1920, Sir Thomas Robinson, C.B.E., M.P., has been appointed chairman and Mr. R. Waddington, M.P., and Professor G. T. Morgan, F.R.S., F.I.C., members of the committee.

Dr. E. F. Armstrong, addressing the opening meeting of the Bristol Section of the Society of Chemical Industry on October 12, said the man in the street did not realise what the chemist had done for the nation, and he was sure the daily Press did not, or they would not see announcements of tremendous discoveries that were either wrong or had been known for many years. This was due to ignorance, and perhaps the chemists were to blame for not teaching the public better.

The Council of the Institution of Mining and Metallurgy have awarded the gold medal of the Institution to Sir Alfred Keogh "on the occasion of his retirement from the Rectorship of the Imperial College of Science and Technology, in recognition of his great services in the advancement of technological education, and as a mark of admiration and respect." The Council of the Institution of Mining Engineers have awarded the medal of the Institution to Sir George Beilby, F.R.S., "in recognition of his valuable contributions to science, with special reference to his researches on fuel." The medals will be presented at the combined dinner of the two Institutions, to be held at the Guildhall, London, on November 16, at which the Prince of Wales and several of his Majesty's Ministers will be present.

A plea for the return of the war-time competition for the common weal, in place of the present competition for personal profit, was made by Major A. G. Church, D.S.O., of the National Union of Scientific Workers, at the second of the weekly lectures arranged by the Industrial League and Council at Caxton Hall, London, last week. Speaking on the subject of "Labour's Status and Reward," Major Church said there was more inherent dignity and survival value in that labour which was directed towards service than to that which was directed towards private profit. Faraday, he said, had to go cap in hand to the Prime Minister for a civil list pension of £300 to carry on his researches, and this he obtained only after a refusal. Faraday would be remembered for all time, but could the same be said of the modern exploiter of his ideas? It was evidently impossible to ensure that the reward of any worker should be equitable.

The first annual report of the Secretary for Mines, which has just been issued (H.M. Stationery Office, 6s. 6d. net), covers the first calendar year of the existence of the Mines Department, constituted under the Mining Industry Act, 1920, and besides the report of the Chief Inspector of Mines contains a review of various matters that are outside his province. The first of the five parts into which the report is divided deals with the coalmining industry in 1921. Part II. relates to the metalliferous mining and quarrying industries, and Part III. to the oil-boring operations carried out for the Government by Messrs. S. Pearson and Sons, which during the year it was decided to close down as far as possible. Part IV. deals with health and safety in the mining and quarrying industries, while Part V. is the Chief Inspector's annual report, including an appendix containing his usual statistical tables of output, numbers of men employed and days worked, plant and equipment, and accidents.

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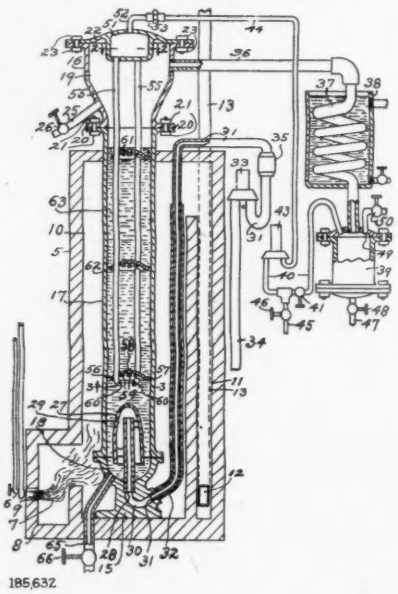
Abstracts of Complete Specifications

185,632. Cracking Hydrocarbons, Process and Apparatus for. F. G. Niece, 399, East 124th Street, Cleveland, Ohio, U.S.A. Application date, September 7, 1921.

In this process, heavy hydrocarbon oils are passed through a molten metal, and the resulting gas and vapour is also passed through the molten metal. A furnace casing 5 is fitted with an oil burner 6 which heats an inner chamber 17, 18 containing molten lead. The upper end of this inner chamber projects outside the furnace casing, and is closed by a cover 22. A tube 28 projects upwards into the chamber 18 and is covered by an inverted bell 27, so that the heavy oil which is supplied through the pipe 31, 30 is de ivered into this bell and distributed into the molten metal. The vapour passes out by the pipe 36 to a condensing coil 37 which discharges into a receiver 39. Any uncondensed gas and vapour passes through the pipe 40, 44 to the top of the cracking chamber where the vapour is delivered into a separate compartment 51. Vapour then passes downwards through pipes 55, and is discharged through outlets 60 just below a perforated baffle plate 56 within the molten lead so that the vapour passes upwards through the molten metal and is



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distributed by baffles 62, 61. The oil burner 6 is regulated to maintain the temperature of the molten lead between 400° C. and 700° C., depending on the nature of the heavy oil, and the hydrocarbon oil is delivered into the molten metal at a pressure of about 190 lbs. per square inch. It is found that a very complete cracking is affected by this process and that practically no liquid residue or carbon is produced. The apparatus is particularly suitable for treating fuel oil of 32°–34° Bé. with no appreciable loss of material and with a high yield of gasolene.

185,659. Aqueous Solutions Containing Oxygen, and Methods of Producing Same. O. Y. Imray, London. From Aquazone Laboratories Inc., Los Angeles, Cal., U.S.A. Application date, October 13, 1921.

This process makes use of the fact that the coefficient of solubility of oxygen in water is greater than the coefficient of solubility of nitrogen. Air at a pressure of 130 to 140 lbs. per square inch is forced through water in a closed vessel for 30 to 40 minutes at a temperature of about 54° F. The oxygen is selectively dissolved and the treated water is transferred under pressure to sealed containers. Under these conditions the water is supersaturated with oxygen and may contain as much as 48 cubic centimetres per litre of water. This solution of oxygen is stable, and the gas is only slowly liberated at ordinary temperatures if the pressure is released.

185,681. Filling Bodies for Absorption and Reaction Towers. H. Prym, Stolberg, Rheinland, Germany. Application date, November 29, 1921.

Filling bodies for reaction towers are made of sheet metal bent into the form of short cylinders or rings. The free ends of the metal strips are bent inwards and terminate within the ring thus formed. In some cases the free ends may extend across the interior of the ring to the opposite periphery. This construction gives a large surface area and prevents the rings from passing one into the other in cases in which they are maintained in motion.

185,779. Oily Pastes or Emulsions, Process for the Manufacture of, from Mineral and Other Oils. Plauson's (Parent Co.), Ltd., 17, Waterloo Place, London, S.W.1. From H. Plauson, 14, Huxter, Hamburg, Germany. Application date, April 6, 1921.

Mineral oil or tar oil is subjected to high-speed mechanical disintegration in a colloid mill such as described in Specification No. 155,836 (see The Chemical Age, Vol. IV, p. 313). The oil is mixed with water and an insoluble mineral solid, and it is found that the very finely divided solid acts as a nucleus for the oil particles. If one part of oil and six parts of water are used a paste is obtained, or if ten parts of water are used a liquid emulsion is obtained. In an example, a viscous hydrocarbon oil is converted into a paste with colloidal graphite and water and 1–3 per cent. of cocoa butter or other vegetable or animal fat. The product is suitable for high-speed lubrication. Other examples are given of the treatment of coal tar oils and fish oil.

185,780. Gas Purification, Process and Apparatus for. K. Cox, 311, Upper Richmond Road, Putney, London, S.W., R. P. Kerr, 9, Belle Vue Terrace, Low Fell, Gateshead-on-Tyne, and E. J. Baty, 157, Dunstable Road, Luton. Application date, April 7, 1921.

This process is an improvement on the Claus process for the purification of gas from sulphuretted hydrogen and/or sulphur dioxide with recovery of sulphur. A higher and more uniform efficiency is obtained by controlling the temperature of the reaction in the contact material, which may be iron, alumina or manganese. This is effected by providing a series of flat pipe coils arranged parallel to one another within the contact material. The required temperature of the material is maintained by passing steam, liquids of high boiling point, or flue gases through the pipe coils, and this enables the purification of the gas to commence, at the beginning of the operation without deposition of sulphur. If sufficient heat is evolved in the reaction to cause a rise of temperature, a cooling fluid may be passed through the pipes. The process is particularly applicable for purifying gas containing sulphuretted hydrogen down to 0·1 per cent. by volume, since the heat of the reaction itself is very small. If the proportion is above 1 per cent., a cooling medium may be required. The heating coils may be connected to a steam generator so that the water which condenses in them is returned to the generator, or a liquid having a high boiling point, such as an oil obtained from a low temperature carbonisation process, may be used to avoid the use of high pressures. The effluent gases may be heated to prevent the deposition of sulphur.

185,782. Hydrocarbon Oils and Other Oils and Fats, Process of Increasing the Consistency of. Hugo Meyer zu Eissen genannt Frentrup 89-91 Alt Moabit, Berlin, and P. Kiederich, 32 Essenerstrasse, Berlin. Application date, April 12, 1921.

The consistency of hydrocarbon oils and other oils and fats is increased by adding a mixture obtained by partly splitting two or more fats or oils to fatty acids, to an extent not exceeding 50 per cent., in the presence of a saponifying medium. At least one of the fats or oils, such as castor oil, must be split by a sulpho-aromatic acid.

185,808. ELECTROLYTIC REFINING OF TIN, PROCESS FOR. W. P. Thompson, Liverpool. From W. J. Aikens, Dunville, Ontario, Canada. Application date, May 31, 1921.

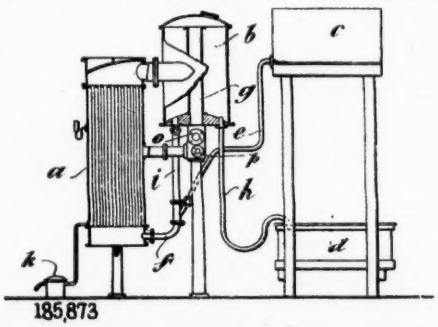
The object is to prevent the deposition of lead on the cathode in the refining of tin. The electrolyte consists mainly of stannous hydrofluosilicic acid with free fluosilicic acid, and a small quantity of phosphoric acid (0·1–0·3 per cent.) is added to render the lead insoluble in the form of lead phosphate. Two sets of tanks are used containing a 15·5 per cent. solution of hydrofluosilicic acid, and these are alternately used for electrolysis and for replenishing the electrolyte by the solution of impure tin. In the electrolysis, the cathodes are of pure tin, and the anodes of impure tin. and phosphoric acid is added from time to time as required. A crystalline structure of tin on the cathode which might short-circuit the electrodes, is prevented by adding about 0·1 per cent. of cresylic acid, while the deposit may be rendered hard and compact by adding 0·01–0·05 per cent. of glue.

185,859. COPPER AND NICKEL, TREATMENT OF MATTE AND OTHER MATERIALS AND SOLUTIONS CONTAINING. H. G. C. Fairweather, Glasgow. From N. V. Hybinette and R. L. Peek, British American Nickel Co., Ottawa, Canada. Application date, June 15, 1921.

The process is for separating copper and nickel from a solution by cementation of copper. Bessemerised copper nickel matte is ground and roasted, and then treated with dilute sulphuric acid to dissolve out most of the copper. Part of the matte is then reduced to the metal at the lowest temperature possible by carbon, hydrogen, carbon monoxide or hydrocarbons. The remainder is dissolved and refined by solution in sulphuric acid, or by reduction to the metal and purification from a solution or an electrolyte. The portion of the material to be reduced should contain about two parts of nickel to each part of copper in the remaining portion. The copper-nickel solution is treated with a large excess of the metallic powder, and the cementation thus started is repeated with fresh solution until no more copper will cement out without heating the solution, so that the metallic powder still contains nickel. This copper-nickel material is mixed with partly roasted matte and subjected to an oxidising roast. The process is applicable to the purification of nickel-copper sulphate solutions obtained from a nickel-copper anode, and the purified nickel sulphate solution may then be returned to the electrolytic cell and used again in the electrolysis, the whole process being carried out without change of temperature.

185,873. EVAPORATORS AND DISTILLING APPARATUS. Blair, Campbell and McLean, Ltd., and J. L. Ferguson, Woodville Street, Govan, Glasgow. Application date, June 23, 1921.

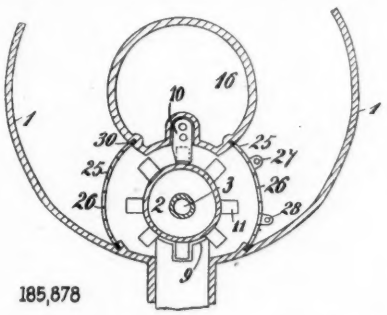
This evaporating or distilling apparatus comprises a tubular heating element connected to a separator which returns part of the concentrated liquor to the heating element to mix with the weak liquor, and thus ensures that the walls of the heating tubes are always covered so that burning is avoided. The weak liquor passes from a tank *c* through pipes *e*, *f* to the bottom of the tubular heater *a*, from which the vapour passes to a separator *b*. The vapour passes out by the pipe *g* and



part of the liquor passes through a pipe *h* to a tank *d*. The remainder of the liquor returns by the pipes *i*, *f* to the heater, and thus increases the volume and also the temperature of the incoming liquor. In a modified apparatus the weak liquor from the tank *c* passes through a tubular heat exchanger where it is heated by the hot concentrated liquor from the separator *b* in passing to the tank *d*. The weak liquor then passes to another tubular heat exchanger where it is heated by condensed steam from the heater *a*, and the liquor then passes into the heater *a*. The apparatus may be worked under vacuum or under atmospheric pressure, and is suitable for the recovery of benzene from oils and greases.

185,878. HIGH SPEED DISINTEGRATORS. Plauson's (Parent Co.), Ltd., 17, Waterloo Place, London, S.W.1. From H. Plauson, 14, Huxter, Hamburg, Germany. Application date, June 25, 1921.

Specification No. 155,836 (see THE CHEMICAL AGE, Vol. IV, p. 313) describes a colloid mill for converting solids into the colloidal form by high speed mechanical disintegration in the presence of liquids. It is now found that the expenditure of



power for driving such a mill may be reduced 25 per cent. by providing suitable baffles in the liquid to prevent or reduce the formation of eddy currents. A rotary disintegrator 2 is mounted on a shaft 3 eccentrically in a casing 1, and is driven at a speed of 6,000 to 18,000 revolutions per minute. A central cylindrical deflector 16 carries fixed beaters 10 and the casing carries fixed beaters 9 which coact with the revolving beaters 11. Cylindrical guide blades or vanes 26 provide orifices 25, so that the continuous circulation of liquor takes place through the disintegrating zone.

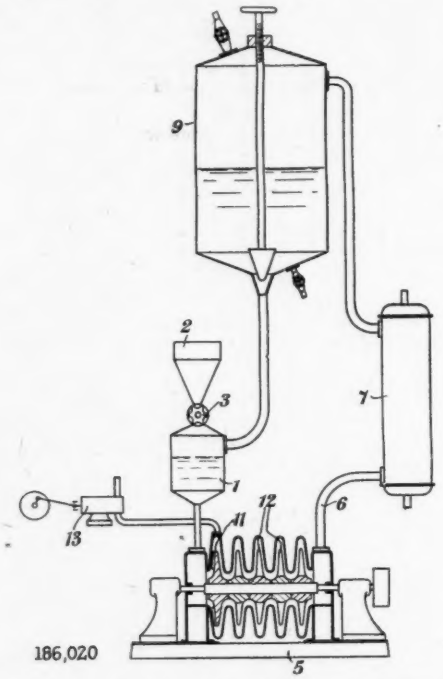
185,913. AMINO-ALCOHOLS OF THE QUINOLINE SERIES, MANUFACTURE OF. O. Y. Imray, London. From Society of Chemical Industry in Basle, Switzerland. Application date, July 20, 1921.

The starting materials are 2-phenylquinoline-4-carboxylic acid, its nitrile, its derivatives or its substitution products. The acid may be converted into 2-phenylquinolyl-4-alkyl ketone by condensing its ester with fatty acid esters in the presence of sodium ethylate to produce 2-phenyl-4-quinoloyl fatty acid esters, and then treating these with acids to produce the ketone. The latter is reduced through its isonitroso compound to the 2-phenylquinolyl-4-amino-alcohol, or the ketone halogenised in the alkyl group is caused to react with an amine, and the 2-phenylquinolyl-4-alkyl-amino ketone is reduced to the corresponding amino-alcohol.

186,020. CYANAMIDE, METHOD OF AND APPARATUS FOR PRODUCING A SOLUTION OF, FROM CALCIUM CYANAMIDE. Wargons Aktiebolag and J. H. Lidholm, Wargon, Sweden. International Convention date, December 1, 1921.

Concentrated solutions of cyanamide are produced by successively adding crude calcium cyanamide to water or a weak solution of cyanamide, and simultaneously adding carbon dioxide to precipitate calcium carbonate. The total volume of the solution in the circulation system increases owing to addition of cyanamide, so that delay occurs before the fresh calcium cyanamide is neutralised by the carbon dioxide, and polymerisation of the cyanamide into dicyandiamide takes place. This is avoided in the present invention by adding the carbon dioxide close to the point at which the fresh cyanamide is added. The cyanamide is supplied from a hopper 2 through valve 3 to a tank 1 of small volume compared with that of the system. The mixture passes to an apparatus 5 comprising a centrifugal pump 11 and a series of beater wheels 12. Carbon dioxide is introduced under pressure from a pump 13, and the mixture passes from a pipe 6 to a cooler 7, and thence tangentially into the upper part of a vessel 9 containing water or weak cyanamide solution. The increase in volume of the

solution is taken up by the tank 9, so that the fresh cyanamide supplied to the vessel 1 quickly reaches the point at which the carbon dioxide is introduced.



NOTE.—Abstracts of the following specifications, which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention :—161,581 (Rhenania Verein Chemischer Fabriken Akt.-Ges.) relating to a process for the manufacture of sulphurous acid, see Vol. IV, p. 679 ; 165,724 (Deutsche Petroleum Akt.-Ges., S. Kacser and E. Bauer) relating to distillation retorts, see Vol. V., p. 286 ; 167,769 (A. Riedel) relating to treatment of ammonium chloride, see Vol. V., p. 464.

International Specifications not yet Accepted

184,778. ACETYLENE. Elektrizitätswerk Lonza, Basle, Switzerland. International Convention date, August 18, 1921.

Acetylene is freed from phosphoretted and sulphuretted hydrogen by means of alkali hypochlorite solution. The generation of free hypochlorous acid is prevented by adding an alkali bicarbonate. The purifying solution may be regenerated by adding potassium chromate and electrolysing with graphite anodes.

184,795. ALKALI SULPHIDES AND HYDROSULPHIDES. J. Ephraim, 68, Königgrätzerstrasse, Berlin. International Convention date, August 20, 1921.

Alkali sulphates or carbonates are mixed with an alkaline earth or magnesium oxide or hydroxide, and treated with sulphuretted hydrogen to produce alkali sulphides and hydrosulphides and an insoluble by-product.

184,798. LEAD OXIDES. Soc. Gamichon Frères, 95, Rue de Flandre, Paris. International Convention date, August 19, 1921.

Solid, powdered, or molten lead is fed into a horizontal rotating cylinder provided with internal baffles. The cylinder is heated, and air is passed through for a sufficient time to oxidise the lead. The air may be mixed with a substance which facilitates the oxidation.

184,800. ARTIFICIAL FERTILISERS. J. Gradl, Munich, Germany. International Convention date, August 15, 1921.

Carbonised organic material or other finely divided or colloidal carbon is mixed with an oxidiser such as potassium, ammonium, or other nitrate, and a catalyst such as manganese peroxide, clay, aluminium compounds, magnesia or other magnesium compounds. Sawdust, peat, seaweed, or sulphite lye may be treated with sulphur trioxide to obtain the carbon, and the resulting sulphuric acid may then be used for treating raw phosphates. Examples are given of the use of wood charcoal to form a fertiliser, and of the treatment of peat and its conversion into a fertiliser.

LATEST NOTIFICATIONS.

186,899 and 186,900. Manufacture of methane. Farbwerke vorm. Meister, Lucius, and Brüning. October 4, 1921.

186,912. Process and apparatus for synthesising ammonia. Nitrogen Corporation. October 5, 1921.

186,927. Process of gasifying and carbonising coal and like fuel substances. Soc. Lyonnaise des Eaux et de l'Eclairage. October 7, 1921.

Specifications Accepted, with Date of Application

165,451. Gases and vapours, Absorption and purification of. R. Adler. June 28, 1920.

166,525. Lixiviation, Method of and apparatus for. R. Adler. July 13, 1920.

168,070. Calcium cyanamide, Method of granulating. Stockholms Superfosfat Fabriks Aktiebolag. August 21, 1920.

172,923. Oils and fats, Process for the purification of. N. Goslings. December 14, 1920. Addition to 167,462 as modified by 167,463.

186,375. Carbonaceous or other materials, Retorts for the treatment of. F. D. Marshall. May 24, 1921.

186,397. Powdered, comminuted, or finely divided substances, Means for facilitating the delivery or flow of—from containers and through conduits and the like. L. Slater. June 21, 1921.

186,457–8. Metallic nickel from nickel-carbonyl, Manufacture and production of, and apparatus therefor. H. E. Fierz and H. A. Prager. July 14, 1921.

186,462. Grinding or disintegrating and mixing machines. J. W. Spensley. July 18, 1921.

186,497. Tungsten, Manufacture of. General Electric Co., Ltd., and C. J. Smithells. August 23, 1921.

186,515. 1-4-naphthol sulphonic acid, Manufacture of. British Dyestuffs Corporation, Ltd.; J. Baddiley, J. B. Payman, and E. G. Bainbridge. September 10, 1921.

186,517. Basic dyestuffs possessing affinity for unmordanted vegetable fibre, Manufacture of. British Dyestuffs Corporation, Ltd.; J. Baddiley, E. H. Rodd, and H. H. Stocks. September 14, 1921.

Applications for Patents

Barnard, C. M. Process for manufacture of benzidine. 27305. October 9.

Chemische Fabrik in Billwarder vorm., Hell and Sthamer Akt.-Ges., and Hasenclever, P. Production of chrome-alum. 27717, 27718. October 12. (Germany, October 12, 1921.)

Farbwerke vorm. Meister, Lucius, & Brüning. Manufacture of formaldehyde. 27311. October 9. (Germany, November 25, 1921.)

Farbwerke vorm. Meister, Lucius, & Brüning. Apparatus for absorbing gases, etc., by charcoal. 27446. October 10. (Germany, October 10, 1921.)

Howles, F., and McDougall, I. Process for obtaining alkaloids or their salts. 27826. October 13.

Howles, F., and McDougall, I. Process for preparation of insecticides. 27827. October 13.

Howles, F., and McDougall, I. Process for manufacture of lead arsenate. 27828. October 13.

Kammermann, G. Apparatus for extraction of oils and greases from vegetable substances. 27560. October 11. (Belgium, August 9.)

Metals Production, Ltd., and Perkins, W. G. Recovery of lead from lead sulphate. 27608. October 11.

Taplin, T. J., Metals Production, Ltd., and Perkins, W. G. Leaching copper, etc. 27609. October 11.

Mourgeon, L. Ammonia manufacture. 27696. October 12.

Reynard, O., Tapping, F. F., and Thornley, F. C. Clarification and filtration of slimes, etc. 27297. October 9.

Reynard, O., Tapping, F. F., and Thornley, F. C. Plastic composition, and process for making same. 27302. October 9.

Scottish Dyes, Ltd., Thomas, J., and Thompson, R. F. Colouring-matters. 27328. October 9.

Soc. Ricard, Allenet, et Cie. Process for rendering soluble liquid fuel mixtures of petrol and alcohol. 27800. October 13. (Belgium, December 28, 1921.)

Stacey, F. Manufacture of gaseous medium for treatment of flour. 27760. October 13.

Stacey, F. Machine for generating a gaseous medium for treatment of flour. 27895. October 14.

Temperley, J. Manufacture of tar macadam, etc. 27436. October 10.

Thompson, W. P., and Visser, C. C. Process for de-watering activated sludge and producing a fertiliser therefrom. 27377. October 10.

Wilputte, L. Coke oven decarbonisation. 27273. October 9.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

LONDON, OCTOBER 19, 1922.

THE activity reported in our last issue has been fairly well maintained this week, and business has been as good as can be expected.

The tone is very firm and some further advances have taken place in one or two products.

The export demand is only quiet, although inquiries from the Far East have been more in evidence.

General Chemicals

ACETONE is practically unobtainable for near delivery.
ACID ACETIC maintains its advance and is in brisk request.
ACID CITRIC is idle and price nominal.
ACID FORMIC has slightly advanced in value and trade is good.
ACID LACTIC has also advanced in price and business has been quite active.
ACID TARTARIC is only in very poor request but the price is nominally unchanged.
BARIUM CHLORIDE is still easier and the export demand has fallen off.
COPPER SULPHATE is unchanged.
CREAM OF TARTAR is in much better request, especially on export account, and the price is firm.
FORMALDEHYDE maintains its improvement and is now very scarce on the spot.
IRON SULPHATE only passes slowly into consumption.
LEAD ACETATE is firm and brisk business is reported.
LEAD NITRATE is without change.
LITHOPHONE has been in much better request and the price is firm.
POTASSIUM CARBONATE is in small inquiry and the price is unchanged.
POTASSIUM CAUSTIC is stagnant and price easy.
POTASSIUM CHLORIDE is firm with quite a good business to report.
SODIUM ACETATE has been in good request and the price is firm.
SODIUM HYPOSULPHITE remains moderately active on current quotations.
SODIUM PHOSPHATE is much firmer and the demand is better.
SODIUM PRUSSIATE remains scarce and firm.
SODIUM SULPHIDE is a shade easier but the demand has improved.
ZINC OXIDE is very scarce and firm.

Coal Tar Intermediates

There is very little of interest to report in this market and trade continues on very restricted lines.

ALPHA NAPHTHOL.—Only a small business is reported.
ALPHA NAPHTHYLAMINE is in fair request at last quoted figure.
ANILINE OIL is easier, but the demand seems to be fairly well maintained.
ANILINE SALT.—Only a small export inquiry.
BENZIDINE BASE.—In fair demand on home trade account.
BETANAPHTHOL has been in better request and stocks in consumers' hands would appear to be becoming short.
DIMETHYANILINE.—Only a small inquiry.
DINITROPHENOL has been in better request.
DIPHENYLAMINE is scarce and firm.
"G" SALT.—A small demand only.
"H" ACID is in better supply, but the price is firm.
NAPHTHIONIC ACID is quietly steady.
NITROBENZOL.—Without change in value.
PARANITRANILINE is moderately active and steady in price.
PARAPHENYLENEDIAMINE is firm and in good request.
TOLIDINE BASE.—Only in small request.
XYLIDINE.—A few orders have been placed.

Coal Tar Products

The tone of the market in general is good, and the demand for most of the products is fairly well maintained.

90's BENZOL.—Lower prices have been accepted, and to-day's quotation is 1s. 8½d. to 1s. 9d. per gallon in the North, and 1s. 11d. to 2s. per gallon in London.
PURE BENZOL remains quiet at about 2s. 2d. per gallon in the North, and 2s. 4d. per gallon in the South.
CREOSOTE OIL.—There is some irregularity about the market for this article, but, on the whole, the position is good. To-day's quotations are 6d. per gallon in the North, and 7d. per gallon in London at works.
CRESYLIC ACID.—The market for this article is still disorganised, owing to the new American tariff, and it is not possible to give quotations, but sellers still ask the same prices as last week.
SOLVENT NAPHTHA is in fair demand at about 1s. 11d. per gallon in the North, and 2s. in London.
HEAVY NAPHTHA is slow of sale at 1s. 6d. per gallon at works.
NAPHTHALENE.—There is more activity in this article, and business has been done in all grades, but prices do not show any improvement. The quotations to-day are £4 to £5 per ton for drained, £6 to £6 10s. for whizzed, and £7 for pressed.
PITCH.—The market is better, with sales at an advanoe on last week's prices. To-day's quotations are 105s. to 107s. 6d. f.o.b. East Coast, and 107s. 6d. to 110s. f.o.b. London.

Sulphate of Ammonia

There is no change in the position.

Current Prices

Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	1	8	to	0	1	10
Acetone oil	ton	80	0	0	to	82	10	0
Acetone, pure	ton	122	0	0	to	125	0	0
Acid, Acetic, glacial, 99–100%	ton	67	0	0	to	68	0	0
Acetic, 80% pure	ton	43	0	0	to	44	0	0
Arsenic, liquid, 2000 s.g.	ton	67	0	0	to	70	0	0
Boric, cryst.	ton	60	0	0	to	65	0	0
Carbolic, cryst. 39–40%	lb.	0	0	6½	to	0	0	6¾
Citric	lb.	0	1	10	to	0	2	0
Formic, 80%	ton	57	10	0	to	58	0	0
Gallic, pure	lb.	0	2	11	to	0	3	0
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol.	ton	40	0	0	to	43	0	0
Lactic, 60 vol.	ton	43	0	0	to	44	0	0
Nitric, 80 Tw.	ton	29	0	0	to	31	0	0
Oxalic	lb.	0	0	7¾	to	0	0	8
Phosphoric, 1.5	ton	38	0	0	to	40	0	0
Pyrogallic, cryst.	lb.	0	5	9	to	0	6	0
Salicylic, Technical	lb.	0	0	10½	to	0	1	0
Salicylic, B.P.	lb.	0	1	5	to	0	1	6
Sulphuric, 92–93%	ton	7	10	0	to	8	0	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb.	0	1	3	to	0	1	3½
Alum, lump	ton	10	0	0	to	10	10	0
Alum, chrome	ton	27	0	0	to	28	0	0
Alumino ferric	ton	9	0	0	to	9	5	0
Aluminium, sulphate, 14–15%	ton	10	10	0	to	11	0	0
Aluminium, sulphate, 17–18%	ton	11	10	0	to	12	0	0
Ammonia, anhydrous	lb.	0	1	8	to	0	1	9
Ammonia, .880	ton	33	0	0	to	35	0	0
Ammonia, .920	ton	21	0	0	to	23	0	0
Ammonia, carbonate	lb.	0	0	4	to	0	0	4½
Ammonia, chloride	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)	ton	35	0	0	to	37	10	0
Ammonia, nitrate (pure)	ton	35	0	0	to	40	0	0
Ammonia, phosphate	ton	68	0	0	to	70	0	0

	Per	£	s.	d.		£	s.	d.
Ammonia, sulphocyanide	lb.	0	1	10	to	0	2	0
Amyl acetate	ton	175	0	0	to	185	0	0
Arsenic, white, powdered	ton	49	0	0	to	51	0	0
Barium, carbonate, 92–94%	ton	15	0	0	to	16	0	0
Barium, Chlorate	ton	65	0	0	to	70	0	0
Barium Chloride	ton	20	0	0	to	21	0	0
Nitrate	ton	27	10	0	to	30	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	1	0	to	0	1	3
Bleaching powder, 35–37%	ton	12	0	0	to		—	
Borax crystals	ton	29	0	0	to	33	0	0
Caffein	lb.	0	13	6	to	0	14	6
Calcium acetate, Brown	ton	10	10	0	to	11	10	0
" " Grey	ton	15	10	0	to	16	0	0
Calcium Carbide	ton	16	0	0	to	17	0	0
Chloride	ton	6	0	0	to		—	
Carbon bisulphide	ton	50	0	0	to	52	0	0
Casein technical	ton	47	0	0	to	55	0	0
Cerium oxalate	lb.	0	4	6	to	0	4	9
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb.	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	2	to	0	1	3
Sulphate	ton	26	10	0	to	27	0	0
Cream Tartar, 98–100%	ton	100	0	0	to	102	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol.	ton	74	0	0	to	76	0	0
Formusol (Rongalite)	lb.	0	2	6	to	0	2	9
Glauber salts, commercial	ton	5	0	0	to	5	10	0
Glycerine, crude	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	5	to	0	2	6
Iron perchloride	ton	30	0	0	to	32	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	41	0	0	to	42	0	0
Carbonate (White Lead)	ton	42	0	0	to	47	0	0
Nitrate	ton	44	10	0	to	45	0	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	23	10	0	to	24	0	0
Magnesium chloride	ton	7	0	0	to	7	10	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	8	0	0	to	8	10	0
Sulphate (Druggists')	ton	11	0	0	to	11	10	0
Manganese Borate, commercial	ton	65	0	0	to	75	0	0
Sulphate	ton	60	0	0	to	62	0	0
Methyl acetone	ton	70	0	0	to	75	0	0
Alcohol, 1% acetone	ton	70	10	0	to	75	0	0
Nickel sulphate, single salt	ton	49	0	0	to	51	0	0
Ammonium sulphate, double salt	ton	51	0	0	to	52	0	0
Potash, Caustic	ton	32	0	0	to	33	0	0
Potassium bichromate	lb.	0	0	6½	to		—	
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride, 80%	ton	12	0	0	to	12	10	0
Chlorate	lb.	0	0	4½	to	0	0	5
Metabisulphite, 50–52%	ton	84	0	0	to	90	0	0
Nitrate, refined	ton	43	0	0	to	45	0	0
Permanganate	lb.	0	0	8½	to	0	0	9
Prussiate, red	lb.	0	4	6	to	0	4	9
Prussiate, yellow	lb.	0	1	7	to	0	1	8
Sulphate, 90%	ton	13	0	0	to	13	10	0
Salammoniac, firsts	cwt.	3	3	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	24	10	0	to	24	15	0
Arseniate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	5½	to		—	
Bisulphite 60–62%	ton	23	0	0	to	24	0	0
Chlorate	lb.	0	0	3¾	to	0	0	4
Caustic, 70%	ton	20	10	0	to	21	0	0
Caustic, 76%	ton	21	10	0	to	22	10	0
Hydrosulphite, powder, 85%	lb.	0	1	9	to	0	2	0
Hyposulphite, commercial	ton	12	0	0	to	12	10	0
Nitrite, 96–98%	ton	29	10	0	to	30	0	0
Phosphate, crystal	ton	16	10	0	to	17	0	0
Perborate	lb.	0	0	11	to	0	1	0
Prussiate	lb.	0	0	11½	to	0	1	0
Sulphide, crystals	ton	12	0	0	to	12	10	0
Sulphide, solid, 60–62%	ton	20	10	0	to	22	10	0
Sulphite, cryst.	ton	12	10	0	to	13	0	0
Strontium carbonate	ton	55	0	0	to	60	0	0
Strontium Nitrate	ton	45	0	0	to	48	0	0
Strontium Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Sulphur, Flowers	ton	11	0	0	to	12	0	0
Roll	ton	11	0	0	to	12	0	0
Tartar emetic	lb.	0	1	4	to	0	1	5
Theobromine	lb.	0	12	6	to	0	13	6

	Per	£	s.	d.		£	s.	d.
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride 102° Tw.	ton	21	0	0	to	22	10	0
Chloride, solid, 96–98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	37	0	0	to	38	0	0
Dust, 90%	ton	45	0	0	to	47	10	0
Sulphate	ton	17	10	0	to	18	10	0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	2	3	to	0	2	6
Alphanaphthol, refined	lb.	0	3	0	to	0	3	3
Alphanaphthylamine	lb.	0	2	0	to	0	2	1
Aniline oil, drums extra	lb.	0	1	0	to	0	1	1
Aniline salts	lb.	0	1	0	to	0	1	1
Anthracene, 40–50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	6	to	0	4	0
Benzidine, base	lb.	0	5	3	to	0	5	6
Benzidine, sulphate	lb.	0	5	3	to	0	5	6
Benzoic acid	lb.	0	1	9	to	0	1	1
Benzoate of soda	lb.	0	1	9	to	0	2	0
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	4	9	to	0	5	0
Betanaphthol	lb.	0	1	4	to	0	1	4½
Betanaphthylamine, technical	lb.	0	5	0	to	0	5	6
Croceine Acid, 100% basis	lb.	0	3	6	to	0	3	9
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	2	9	to	0	3	0
Dinitrobenzol	b.	0	1	3	to	0	1	4
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	5	to	0	1	6
Dinitrophenol	lb.	0	1	9	to	0	2	0
Dimethylaniline	lb.	0	2	6	to	0	2	9
Diphenylamine	lb.	0	4	3	to	0	4	6
H-Acid	lb.	0	6	3	to	0	6	9
Metaphenylenediamine	lb.	0	4	9	to	0	5	3
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	6	0	to	0	6	6½
Metatoluylenediamine	lb.	0	4	6	to	0	4	9
Monosulphonic Acid (2.7)	lb.	0	5	6	to	0	6	0
Naphthionic acid, crude	lb.	0	3	0	to	0	3	3
Naphthionate of Soda	lb.	0	3	0	to	0	3	3
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Neville Winther Acid	lb.	0	7	9	to	0	8	0
Nitrobenzol	lb.	0	0	9	to	0	0	9½
Nitronaphthalene	lb.	0	1	3	to	0	1	4
Nitrotoluol	lb.	0	1	0	to	0	1	2
Orthoamidophenol, base	lb.	0	12	0	to	0	12	6
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	1	6	to	0	1	9
Orthonitrotoluol	lb.	0	0	8	to	0	0	10
Para-amidophenol, base	lb.	0	9	0	to	0	9	6
Para-amidophenol, hydrochlor	lb.	0	8	6	to	0	9	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	7
Paranitraniline	lb.	0	3	6	to	0	3	9
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	5	0	to	0	5	3
Paraphenylenediamine, distilled	lb.	0	10	6	to	0	10	9
Paratoluidine	lb.	0	6	0	to	0	6	6
Phthalic anhydride	lb.	0	2	9	to	0	3	0
Resorcin, technical	lb.	0	4	6	to	0	5	0
Resorcin, pure	lb.	0	6	9	to	0	7	0
Salol	lb.	0	2	0	to	0	2	3
Sulphanilic acid, crude	lb.	0	1	0	to	0	1	1
Tolidine, base	lb.	0	6	6	to	0	7	0
Tolidine, mixture	lb.	0	2	6	to	0	2	9

Northern Polytechnic Chemical Association

For the Session 1922–23, the Northern Polytechnic Institute Chemical Association has arranged a most interesting programme. Mr. W. J. V. Woolcock, M.P. (the president), will open the session on October 24 with an address on "The Effect of Legislation on Chemical Industry." On November 14, Mr. E. V. Evans, F.I.C., will lecture on "The Reproduction of Laboratory Processes on a Large Scale," while Mr. F. M. Potter, F.I.C., has chosen the title "Chemists and Costs" for his lecture on December 12. In the new year Mr. F. H. Carr, F.I.C., will read a paper on "The Manufacture of Organic Chemicals: How such Processes are Established" (January 23); Mr. R. B. Pilcher follows, on February 13, with a paper on "Chemists." On March 13 "The Construction and Equipment of Chemical Factories and Laboratories" will be dealt with by Mr. T. P. Bennett, while the subject of "Coal Washing" will be explained by Mr. T. J. Drakeley, F.I.C. Dr. P. Schidrowitz will deliver the final lecture, on May 22, on "The Acceleration of Vulcanisation."

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

GLASGOW, October 18, 1922.

THE past week has shown a slight improvement in the amount of business put through, inquiries also being fairly numerous.

Prices are steady, with Continental offers only slightly lower notwithstanding the value of the mark.

Industrial Chemicals

ACID ACETIC.—Glacial 98/100 per cent. Spot parcels on offer at £59 per ton, ex wharf, 80 per cent. technical, £41 to £42 per ton; 80 per cent. pure £44 to £45 per ton.

ACID BORACIC.—Prices unchanged. Crystal or granulated £60 per ton; powdered £62 per ton.

ACID CITRIC.—Offered at 1s. 10d., less 5 per cent. ex store spot delivery.

ACID FORMIC, 85%.—Moderate inquiry. Quoted £58 10s. delivered.

ACID HYDROCHLORIC.—Makers' prices unchanged, 6s. 6d. per carboy, ex works.

ACID NITRIC, 80°.—£25 10s. per ton, 84° £27 10s. per ton, ex station.

ACID OXALIC.—Continental offers of 6¾d. per lb., ex quay.

ACID SULPHURIC.—Makers' price unchanged; 144° £4 per ton; 168° £7 5s. per ton, ex works. De-arsenicated, £1 per ton more.

ALUM, LUMP POTASH.—Price about £15 10s., ex store.

ALUMINA SULPHATE.—Continental offers at £8 10s. for 14/15 per cent.; £10 10s. for 17/18 per cent. c.i.f. U.K.

AMMONIA CARBONATE.—Unchanged at 4d. per lb. for lump; 4¼d. per lb. for ground.

AMMONIA LIQUID, 940°.—Offered at 1¾d. per lb.

AMMONIA MURIATE.—Grey galvanisers, quality English material about £32 per ton, f.o.r.; Continental about £26 per ton, c.i.f.

AMMONIA SULPHATE.—25¼%, £14 15s. per ton; 25¾%, neutral, £15 18s. per ton, ex works; October delivery.

ARSENIC, WHITE POWDERED.—In fair demand, £48 to £49 per ton, ex quay.

BARIUM CHLORIDE.—Continental material about £19 per ton, c.i.f. U.K.

BARYTES, FINEST WHITE.—£5 5s. per ton, ex works; Continental material slightly cheaper.

BLEACHING POWDER.—Price unchanged, £12 15s. per ton, ex station spot delivery.

BORAX.—Crystal or granulated, £29 per ton; powdered, £30 per ton, carriage paid, U.K.

CALCIUM CHLORIDE.—English material, £6 per ton, ex quay. Continental to be had at about 20s., less c.i.f. U.K.

COPPERAS, GREEN.—In little demand. Price about £3 15s. per ton, ex works.

DEXTRINE.—Finest Dutch potato dextrine at £20 per ton, c.i.f. Glasgow.

FORMALDEHYDE, 40%.—Spot parcels to be had at £68 per ton, ex wharf.

GLAUBER SALTS.—Fine white crystals, £4 10s. per ton, ex store; coarser quality offered at £4 per ton.

LEAD.—English material, red, £37 15s. per ton; white, £49 15s. per ton; Continental red lead offered at £35 per ton, spot. LEAD ACETATE.—White crystals, £40 per ton, c.i.f. U.K.; brown, about £32 per ton, c.i.f. U.K.

MAGNESITE, GROUND CALCINED.—Finest Euboean, £10 15s. per ton, ex store.

MAGNESIUM CHLORIDE.—Continental material, £5 15s. per ton, ex store. Offered at £4 5s. c.i.f. U.K.

NAPHTHALENE.—Finest sublimed about £15 10s., ex works.

POTASSIUM BICHROMATE.—Makers' price unchanged at 6¼d. per lb. delivered.

POTASSIUM CARBONATE, 90/92%.—Offered at £28 per ton, ex store, spot delivery; 96/98%, about £31 10s. per ton, ex store.

POTASSIUM CAUSTIC, 88/92%.—Price about £29 per ton, ex store.

POTASSIUM CHLORATE.—Crystals or granulated, about 4¼d. per lb.

POTASSIUM MURIATE, 80%.—Offered at £9 10s. per ton, c.i.f. U.K.

POTASSIUM PRUSSIATE.—Spot lots offered at 1s. 6¼d. per lb., ex station.

POTASSIUM SULPHATE (90% basis).—Quoted £13 10s. per ton, ex wharf.

SODIUM ACETATE.—Price about £24 to £25 per ton.

SODIUM BICARBONATE.—Refined quality, £10 10s. per ton, ex quay or station; m.w. quality £1 less.

SODIUM BICHROMATE.—Makers' price unchanged, 5d. per lb. delivered.

SODIUM CARBONATE (Soda Crystals).—£5 10s. to £5 15s. per ton, ex quay or station; m.w. quality £1 less; alkali, 58%, £8 16s. 6d. per ton, ex station, 5 ton lots.

SODIUM CAUSTIC.—76/77%, £23 5s. per ton; 70/72%, £21 5s. per ton; 60/62%, £20 5s. per ton; 98/99% powdered, £26 15s. to £27 15s. per ton, ex station.

SODIUM HYPOSULPHITE.—Commercial crystals, about £12 per ton, ex store; pea crystals, £18 per ton, ex station.

SODIUM NITRATE.—Refined quality, about £12 5s per ton, ex works.

SODIUM SULPHATE (Saltcake 95%).—Price for home consumption, £4 per ton, delivered (contract).

SODIUM SULPHIDE, 60/62%.—Continental material, about £15 per ton, c.i.f. U.K.

SULPHUR.—Government surplus stocks of Sicilian thirds, £3 15s. per ton, ex depot; flowers, £12 per ton; roll, £11 per ton; rock, £10 per ton; ground, £10 per ton. Prices nominal.

TIN CRYSTALS.—Price unchanged at 1s. 2d. per lb.

ZINC SULPHATE.—Offered at £15 10s. per ton, ex works.

Coal Tar Intermediates and Wood Distillation Products

ALPHA NAPHTHOL.—Export inquiry. Price quoted, 2s. 9d. per lb. f.o.b.

ALPHA NAPHTHYLAMINE.—Price remains firm at about 1s. 9d. per lb., delivered.

BETA NAPHTHOL.—Price firm at 1s. 2d. to 1s. 3d. per lb.

CROCEINE ACID.—Home inquiries. Price quoted, 2s. 11d. per lb., 100% basis.

DI-ETHYL-ANILINE.—Home inquiry. Price quoted, 4s. 6d. per lb., carriage paid. Returnable drums.

METANILIC ACID.—Export inquiry. Price quoted, 3s. 9d. per lb., 100% basis, f.o.b.

PARA AMIDO PHENOL HYDROCHLORIDE.—Home inquiry. Price quoted, 8s. 8d. per lb., 100% basis, carriage paid.

PARA AMIDO SALICYLIC ACID.—Export inquiry. Price quoted, 6s. 6d. per lb., 100% basis, f.o.b.

PARANITRANILINE.—Home inquiry. Price quoted, 3s. 3d. per lb., carriage paid.

PARAPHENYLENEDIAMINE BASE.—Home inquiry. Price quoted, 12s. per lb., 100% basis, carriage paid.

PURE XYLOL (COMMERCIAL).—Home inquiry. Price quoted, 3s. per gallon, ex works

R.R. ACID.—Export inquiry. Price quoted, 16s. 3d. per lb., 100% basis, f.o.b.

"S" ACID.—Export inquiry. Price quoted, 14s. per lb., 100% basis, f.o.b.

Autumn Prices for Sulphate of Ammonia

THE prices for sulphate of ammonia for November and December delivery have been fixed by the British Sulphate of Ammonia Federation, Ltd. (30, Grosvenor Gardens, London, S.W.1), as follows:—£16 13s. per ton for neutral quality in fine friable condition, free from lumps, basis 25¼ per cent. ammonia, delivered to consumer's nearest station or wharf in Great Britain, for prompt cash payment, in lots of 4 tons and upwards, with higher charges for smaller lots. Limited quantities of ordinary quality will be available in some districts, and will be sold at 23s. per ton less than the above price, basis 25¼ per cent. ammonia. No quantities bought at these prices may be exported.

Owing to the coal strike in America, the world's supply of sulphate of ammonia will probably be curtailed to an even greater extent than was thought likely two months ago.

The Manchester Chemical Market

[From our own Correspondent.]

Manchester, October 19, 1922.

There have been no striking changes in the situation of the chemical market here since my last report, the general tone remaining quietly healthy. With several of the large chemical-consuming industries operating at increased pressure the effect on the chemical trade, so far as the home section is concerned, is satisfactory, many of the staple lines going more readily into consumption. On the export side, however, little or no improvement can be reported. Buying on Continental account is still very restricted, and, as before, most of the business being put through is for shipment to the Colonies. Prices, on the whole, have been firmly maintained, and, as supplies in many cases are not excessive, it is probable that higher prices will accompany any appreciable increase in demand.

Heavy Chemicals

For the home trade caustic soda is being taken up in regular quantities and export business also is of moderate dimensions; the contract price to home consumers varies from £20 5s. to £22 10s. per ton, according to strength, and for export up to £23 10s. is asked. Saltcake is about £4 per ton but the position is unchanged, not much business being done. Bleaching powder keeps in moderate demand, both for the home trade and for shipment, at £12 to £12 10s. per ton, in softwood casks. Soda crystals are still rather quiet, but the price is maintained at £5 12s. 6d. per ton, delivered. Soda bicarbonate is steady at £10 10s. per ton, in 2 cwt. bags, and sales are improving. Sodium sulphide is easier at £18 per ton for 60-65 per cent. concentrated, crystals offering at £13 per ton. Ammonia alkali, 58 per cent. material, is quiet and a shade easier at £7 17s. 6d. per ton, in bags, for delivery to home users. Hyposulphite of soda is fairly active and quotations are about unchanged at up to £18 10s. for British photographic quality, and £10 10s. per ton for commercial. Nitrite of soda is steady and in moderate demand at £28 10s. per ton. Not much is being done in Glauber salts and £4 10s. per ton is still quoted. Chlorate of soda is selling at 3d. per lb. but business is quieter. Acetate of soda is also less active, with last week's price of £23 per ton still being asked. With supplies of prussiate of soda scarce and demand steady prices are now firmer at 11¼d. per lb. Phosphate of soda is £16 per ton, but there has been no expansion of the demand.

Caustic potash still meets with a moderately active demand at £29 per ton for 88-90 per cent. strength. Carbonate of potash is quiet at £27 15s. per ton for 90-92 per cent. material. There has been no improvement in the available supplies of prussiate of potash and prices continue firm at 1s. 6d. per lb. for yellow and 4s. to 4s. 3d. for red. The position of bichromate of potash is unchanged, and prices keep firm at 6¼d. to 6½d. per lb. Chlorate of potash is steady at 4d. to 4¼d. per lb., but the demand is rather quiet. Permanganate of potash is still quoted at 7¼d. to 7¾d. per lb.

The home trade demand for sulphate of copper has not improved and the material is on offer at last week's range of £26 to £27 per ton; export business, however, is said to be a shade better. Arsenic is scarce and in good demand; white powdered, Cornish makes, is quoted at £48 to £49 per ton. Commercial Epsom salts are unchanged at £6 5s. per ton, inquiry continuing slow. Acetate of lime is firm at £14 10s. for grey and £8 5s. per ton for brown. White sugar of lead is rather quiet at £38 per ton, with brown at £34. Flake litharge is still in moderate inquiry at up to £38 per ton. British-made nitrate of lead is firm at £44. Ammonium muriate is quiet again but prices are unchanged at £35 for grey and £40 per ton for white. Salammoniac, first and second lump is 62s. and 60s. per cwt. Lump alum is selling slowly at about £13 per ton.

Acids and Tar Products

There is little doing in either tartaric or citric acids, but prices are steady and unchanged; tartaric is quoted at 1s. 3d. and citric 2s. per lb. for B.P. quality. Acetic acid keeps firm and meets with a fairly active demand at £65 for glacial and £40 per ton for 60 per cent. technical. Oxalic acid is steady at 7¼d. per lb., but business is slow.

With supplies short and demand still good the price of pitch is higher, and about £4 15s. per ton, f.o.b. Manchester, is now mentioned. Carbolic acid crystals continue firm at 6½d. per lb. Crude carbolic acid is rather scarce at about 2s. per gallon for 60 per cent. material. Solvent naphtha is unchanged from last week, 1s. 9d. being quoted for 90-160 and 1s. 6d. per gallon for 90-190, but the demand is not very good. Creosote oil keeps firm at 6d. to 6½d. per gallon. Cresylic acid is quiet and price nominal at 2s. 6d. per gallon. Crude naphthaline is quoted at up to £7 per ton, according to quality, flake about £17, and crystallised £15 per ton.

British Glues and Chemicals

Presiding at the second ordinary general meeting of British Glues and Chemicals, Ltd., held at the Cannon Street Hotel, London, Mr. T. Walton (the chairman) said that the trading loss recorded in the accounts was due to circumstances beyond their control. A considerable period naturally elapsed between the purchase of their raw materials and the sale of their products, and the fall in demand for and price of products had proceeded at a pace greater than the fall in the cost of raw materials. Trading conditions had been exceedingly difficult, but constant watchfulness had minimised the consequences of continually falling prices and losses on stocks. Stabilisation of exchanges, continued Mr. Walton, was one of the prime essentials for trade improvement, and he was of opinion that cancellation of our war debts from our Allies would result to our national advantage. America had arrived at a decision unfavourable to views expressed on behalf of our nation, but he anticipated the time might come when she would consider it beneath her dignity to require repayment of advances made in a joint cause, or at any rate of those contributions made between the date she entered the war and the date when she was able to send effective man-power. In conclusion, the Chairman said that the company were making a very strenuous attack upon those markets where exchange difficulties are less acute and where buying capacities are comparatively unimpaired or less impaired than those whose currencies are inflated to the point of collapse.

The Relation of Chemistry to Engineering

On Monday Professor F. W. Burstall, Dean of the Faculty of Science and Professor of Mechanical Engineering in the University of Birmingham, delivered an address at the opening meeting of the Birmingham University Chemical Society on "The Relation of Chemistry to Engineering." He showed how, a generation ago, the chemist confined himself to the laboratory study of chemical combination, while the engineer satisfied himself with the shaping of metals and saw no advantage in a specialised knowledge of chemistry. But the chemist who could conduct his operations on a small scale was quite helpless when the same operations were required on an industrial basis. To-day the engineer was studying problems based on purely chemical phenomena, and the chemist was finding that he could obtain far-reaching results by calling in the engineer. In the fixation of nitrogen as ammonia, high pressures were involved, and it was only with the aid of the metallurgist, the mathematician, the physicist, and the engineer, that the chemist obtained satisfactory results. Another process in modern industry, showing the necessity for co-operation between the chemist and the engineer, was the hydrogenation of crude heavy oils. The lecturer concluded by saying that scientific process in the future would tend to be the result of team work rather than the brilliant discoveries of a gifted individual.

Professor Burstall also presented the sessional prizes: The Frankland Medal and Prize to A. R. Bowen, B.Sc., the President's Prize to J. D. Main Smith, Ph.D., B.Sc., Mr. L. M. Jones' Prize to N. D. Sylvester, M.Sc., and the Society's Discussion Prize to I. Ackerman, M.Sc.

Evaporation Losses of Petroleum Products

Mr. L. Schmidt, junior chemical engineer, of the petroleum experimental station of the U.S.A. Bureau of Mines at Bartlesville, Oklahoma, is continuing field and laboratory work on evaparation losses of the lighter products of petroleum. Arrangements have been made to co-operate with refineries at Ponca City, Okla., to determine evaporation losses of certain refined products in their course through the refinery and later in storage. The refineries in general are very much interested in knowing their evaporation losses and finding methods to decrease them.

Company News

MIAMI COPPER CO.—A dividend of 50 cents per share, in respect of the last quarter, is payable on November 15.

BRITISH PORTLAND CEMENT MANUFACTURERS.—An interim dividend of 5 per cent. is payable on ordinary shares on November 1.

DAY AND MARTIN, LTD.—The accounts for the year 1921 show a loss of £34,830, which increases the debit balance carried forward to £48,155.

OLYMPIC PORTLAND CEMENT.—An interim dividend of 5 per cent., less tax, in respect of the year to December 31 next is payable on November 15.

CANADIAN EXPLOSIVES.—A dividend of 1¾ per cent. has been declared for the quarter ended September 30 on the 7 per cent. cumulative preferred shares. This dividend was payable on Monday.

ASSOCIATED PORTLAND CEMENT MANUFACTURERS, LTD.—The transfer books of the 5 per cent. second debenture stock will be closed until November 1 for the preparation of the half-yearly interest warrants.

BABCOCK AND WILCOX, LTD.—The directors have declared an interim dividend on the ordinary shares of 8 per cent., free of tax, for the half-year to June 30 last. At the corresponding period last year 7 per cent., free of tax, was paid.

CELLULOSE HOLDINGS AND INVESTMENT CO., LTD.—Dealings in £500,000 7 per cent. participating first mortgage debenture stock, issued at par, £50 paid, have been specially allowed by the Stock Exchange Committee under Rule 159.

SADLER AND CO., LTD.—The directors' report, to be presented at the annual meeting at Middlesbrough on October 23, states that the profit for the year to June 30 last amounted to £10,918, to which was added £9,900 brought forward, making a total of £20,818. From this has to be deducted £7,000 for depreciation, and a dividend of 6 per cent., less tax, is recommended, absorbing £7,226. £6,592 is carried forward.

MACFARLANE AND ROBINSON.—The accounts for the past year, after charging £1,640 for depreciation, show a loss of £36,718, to which must be added dividends for half-year to June 30, 1921, on the 7 per cent. and 8 per cent. preference shares, making the total £40,219. Deducting balance brought in, £3,121, and £20,000 transferred from reserve fund, there remains a debit balance of £17,098. In view of the loss, the board has had to pass payment of cumulative preference dividends, which fell due on March 31 last.

AMMONIUM FINANCE SYNDICATE.—The accounts for 1921 show that the income for the year was £2,095 in excess of expenditure, reducing the debit brought in to £8,210. No new business has been entered into during the year, but the directors report that the loan made to Natal Ammonium, Ltd., on the security of 1,000 tons of its stock of sulphate of ammonia, has been repaid. The directors have waived their renumeration for the year. The annual meeting was held on Tuesday, at 39, Victoria Street, Westminster.

LAWES' CHEMICAL MANURE.—The directors submit the accounts for two years ended June 30, 1921, and June 30, 1922. Circumstances over which they had no control prevented the issue of the 1921 accounts at the customary time, and they regret unavoidable delay. Loss as at June 30, 1921, £29,329; June 30, 1922, £13,650; total, £42,979; deduct balance brought in from June, 1920, £6,491; net deficit, £36,488, which is to be written off contingent fund, reducing that fund to £19,512. The directors do not recommend a dividend. The annual meeting will be held at the Great Eastern Hotel, Liverpool Street, London, on October 26th, at noon.

FIREPROOF WOOD (OXYLENE) MANUFACTURING CO., LTD.—At an extraordinary general meeting held on Monday, a proposal for the amalgamation of the company with the Timber Fireproofing Co., Ltd., was unanimously approved. Sir Arthur Wheeler, who presided, said the absorption of their company by the Timber Fireproofing Co. would tend to considerable economies in management. The directors had come to the conclusion that one "Fireproofing" share for two "Oxylene" shares was fair. Under the arrangement the shareholders would participate in the foreign rights, which were of considerable value. In the tropics the properties of their treated timber in resisting the ravages of the white ant might well prove of even more value than its resistance to fire.

COLOIL SYNDICATE, LTD.—Mr. H. W. Arnott, presiding on October 13 at the ordinary general meeting, said that, acting in conjunction with other holders of properties, a company was in course of formation for taking over several Colombian properties in which the syndicate was interested. Those properties were situated within 20 to 25 miles of the coast, and recent information was to the effect that wells were being drilled upon the neighbouring properties by American interests, and if any of those wells were successful it would be difficult to put a limit of value upon their Colombian properties. They had recently taken an interest in oil properties in Northern Spain, which the Board intended to hold awaiting developments of neighbouring properties, but owing to favourable alterations in the Spanish laws relating to oil properties, that intention had been modified. The report and accounts were approved, and a resolution was agreed to increasing the capital of the company to £75,000, by the creation of 1,200,000 shares of 1s. each.

EASTERN CHEMICAL CO.—For the year to March 31 last, the result of working, after writing down the value of all stocks to replacement cost and allowing for the usual depreciation, was a loss of £6,889. The directors much regret the unfavourable result, but in view of unsettled conditions of trade both in India and elsewhere and keen competition that has arisen in some of the company's by-products owing to German competition consequent upon the depreciated value of the mark, the result is less unfavourable than might have been expected. They are unable to recommend any dividend. It has been considered advisable to write off the item of £7,055 which appeared in previous balance-sheets to credit of "options and benefits" and as a set-off to this to transfer the premium account £6,368, and balance of reserve for contingencies account, £1,480, to profit and loss account, thereby increasing the carry-forward brought in by £793. The annual meeting will be held at 13, Fenchurch Avenue, London, on October 25, at noon.

UNITED PREMIER OIL AND CAKE CO., LTD.—The report for the year 1921 states that the delay in issuing the accounts has been due to the difficulty in arriving at a settlement of questions arising out of the termination of excess profits duty. The net profit amounted to £93,944; deduct preliminary expenses written off, £9,675; debenture interest, £23,655; and sinking fund debenture stock, £4,715—together £38,045, leaving £55,899; brought in, £24,920; total, £80,819. Less dividend on preference shares for year, £34,431; interim dividend of 2½ per cent., less tax, on ordinary shares, paid January 16, 1922, £13,125, and further interim dividend of 2½ per cent., less income tax, on ordinary shares, paid July 8, 1922, £13,125, leaving to be carried forward £20,138. The directors recommend that the further interim dividend of 2½ per cent. less tax, on the ordinary shares, paid July 8, 1922, be confirmed as a final dividend, making a total distribution of 5 per cent., less tax, for the year. The ordinary general meeting will be held at Winchester House, on October 24, at noon.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OR FIRM OR AGENT.	MATERIAL.	REF. NO.
Warsaw	Copper, antimony, lead, zinc, white lead, etc.	429
Latvia	Oils, metal polish.	6335/F.R./C.P.

Contracts Open

Tenders are invited for the following articles. The latest dates for receiving tenders are, when available, given in parentheses:

SOUTH AFRICA (November 16).—Tar or tar substitute (1,600 tons), for the Municipal Council of Johannesburg. Particulars from Department of Overseas Trade (Room 41), 35, Old Queen Street, Westminster, London, S.W.1. (Reference No.: 9720/E.D./M.P.)

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

EDWARDS, Mr. J. M., 311, Fulham Palace Road, S.W., chemist and optician. (C.C., 21/10/22). £12 16s. 6d. September 12.

PHILLIPS, Miss E. J., 668, Fishpond Road, Bristol, chemist. (C.C., 21/10/22.)—£15 3s September 12.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BENNISONS, LTD., London, S.W., chemists. (M., 21/10/22). Registered October 4. £3,500 debentures to Branch Nominees, Ltd., 15, Bishopsgate, E.C.; general charge. *Nil. August 14, 1921.

C. V. O. CHEMICAL WORKS (1919), LTD., Leicester. (M., 21/10/22). Registered, October 6, £1,500 debentures part of £5,000; general charge. *£9,300. December 21, 1921.

STELLA GILL COKE AND BYE PRODUCTS CO., LTD., London, E.C. (M., 21/10/22). Registered October 3, £30,000 debentures part of £300,000; general charge (except uncalled capital). *£114,300. June 21, 1922.

Receivership

RAYMET AND CO., LTD. (R., 21/10/22.)—P. S. Booth, of 14, Holborn Vizduct, E.C., was appointed receiver and manager on October 16, 1922, under powers contained in debentures dated May 4 and July 14, 1920.

London Gazette

Notice of Intended Dividend

HAMMOND, Alfred, and HAMMOND, Ernest, oil and colour merchants, 2A, Gillingham Road, Gillingham, Kent, under the style of ALFRED HAMMOND AND SON. Last day for receiving proofs, October 28. Trustee, A. H. Ward, Official Receiver, 280A, High Street, Rochester.

Application for Debtor's Discharge

PRESCOTT, Alfred, carrying on business as PRESCOTT AND CO., Rutland Mills, Oswald Street, Hulme, Manchester; Drake Street, Manchester; Holt Town, Manchester; and Mill Bank Chemical Works, Triangle, Halifax, York, chemical and aniline dye manufacturer. (A.F.D., 21/10/22.) Hearing, October 30, 10.15 a.m., Court House, Quay Street, Manchester.

Order Made on Application for Discharge

STEVEN, George, trading as G. STEVENS AND CO., 118, Chorlton Road, Old Trafford, manufacturing chemist. (O.M.A.D., 21/10/22.) Date of order, September 12. Bankrupt to be discharged as from noon, September 12, 1922.

New Companies Registered

BURNE-JONES AND CO., LTD., Montford Place, Kennington Road, S.E. To carry on the business of consulting, civil, agricultural, chemical, waterworks, scientific, optical radio and inspecting engineers, etc. Nominal capital, £3,000 in £1 shares.

CANDLES, LTD., 140, Leadenhall Street, E.C. To acquire from various companies the goodwills and all or any of the assets and liabilities of certain businesses producing making, selling and dealing in illuminants and lubricants of any description; manufacturers of and dealers in oils, greases, glycerine, oleine, insecticides, and toilet and other preparations, etc. Nominal capital, £50,000 in £1 shares (25,001 "A" ordinary and 24,999 "B" ordinary).

DUNESE (POLISHES AND PREPARATIONS), LTD. Chemists, druggists, drysalters, oil and colourmen, manufacturers of and dealers in pharmaceutical, medicinal, chemical, industrial and other preparations, cements, oils, paints, pigments, etc. Nominal capital, £2,000 in 1,800 10 per cent. preference shares of £1 each and 2,000 ordinary, and 2,000 deferred shares of 1s. each. A director: C. F. O. Hamley, 33, Charing Cross Mansions, W.C.2.

E. T. FINLAY AND CO., LTD. Manufacturing and general chemists and druggists, drysalters, soap manufacturers and boilers, etc. Nominal capital, £1,000 in £1 shares. A director: W. Finlayson, 10, Southcoates Avenue, Hull.

GIBSON'S PURE DRUG CO., LTD., 187, Gooch Street, Birmingham. Manufacturing, wholesale and retail chemists, dealers in drugs, chemicals, oils, perfumes, etc. Nominal capital, £3,000 in £1 shares.

LEYLAND PAINT AND VARNISH CO., LTD. Manufacturers of and dealers in water paints, washable distempers, water and oil colours, varnishes, etc. Nominal capital, £40,000 in £1 shares. A director: F. W. Jones, 18, York Road, St. Annes-on-Sea.

MILNER BROS., LTD., 12, Norfolk Street, Strand, W.C.2. Exporters and importers of ferrous and non-ferrous metals and metal products, chemicals, etc. Nominal capital, £3,000 in 1,000 7 per cent. cumulative preference shares of £1 each, and 20,000 ordinary shares of 2s. each.

PEARSE AND STEENBERG, LTD., 9, Bishopsgate, E.C. Dealers in and sellers of soaps, oils, fats and their products, etc. Nominal capital, £1,000 in £1 shares.

PROPRIETARY AND SUNDRIES SUPPLY CO., LTD., 5, St. George's Road, Southwark, S.E.1. Wholesale chemists and druggists; importers, manufacturers of and dealers in drugs, medicines and medical compounds, etc. Nominal capital, £2,500 in £1 shares.

Affairs of a Chemical Manufacturer

THE statutory first meeting of the creditors of Mr. Bernard Sherman, chemical manufacturer, Sugar Lane House, Stratford, was held last week at Bankruptcy Buildings, Carey Street, W.C., Mr. Walter Boyle, Official Receiver, presiding. The Chairman reported that no statement of the debtor's affairs had been lodged, but he had roughly estimated his liabilities at £900, and said that he possessed no assets apart from the sum of £30 which was owing to him. From August, 1906, until the outbreak of the war he was employed as a traveller. He then went into a firm of chemical engineers, who began chemical works at Stratford, but owing to the cancellation of a contract by the Air Board in 1919, that concern went into liquidation. Its business was afterwards sold to a firm in the chemical trade and he became their manager. In March, 1921, he began business as a chemical manufacturer, and, in partnership with two others, carried on business in Sugar Lane House, Stratford. That business was conducted by a limited company, in which he held 3,000 £1 shares. The company had since gone into voluntary liquidation and the debenture holders had foreclosed. In February last, with a sum of £400 borrowed on the security of the shares that he had held in the company, he bought a soap business from a firm who had taken part of the premises, but the business was not a success, and in July he sold it for £150, less £12, in respect of a month's rent, and used the money in payment of tradesmen's debts and in living expenses. The debtor had since transacted no business and had been without occupation. He attributed his failure to bad trade and to the falling of prices of materials and plant and in the rate of exchange. The meeting having passed a resolution for bankruptcy, the estate remained in the hands of the Official Receiver.